BBC MICRO·ELECTRON·ATOM

£1.20

ACORN USER

DECEMBER 1985

GUIDE TO BUSINESS:
- Setting up your system
- Z80 upgrade from Acorn
- How to pick a printer
- Three-in-one from Gemini

FIRST BYTE: Memory options on a BBC/Electron

FANCY FONTS: Super script for your screen

GRAPHICS CRUNCHER: Fewer bytes per picture file

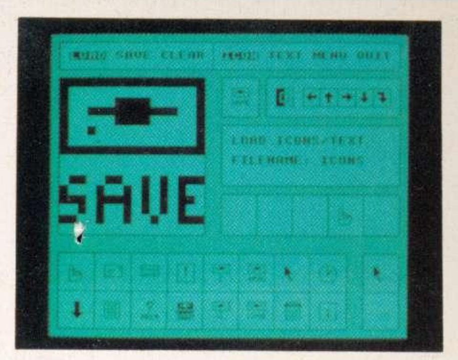
SHUGGY'S GARDEN
Monster chase for Electron or BBC users

COMPETITION
5 Opus Challengers to be won

ICON MASTER — Icon Control System



GIVE YOUR PROGRAMS THAT PROFESSIONAL TOUCH

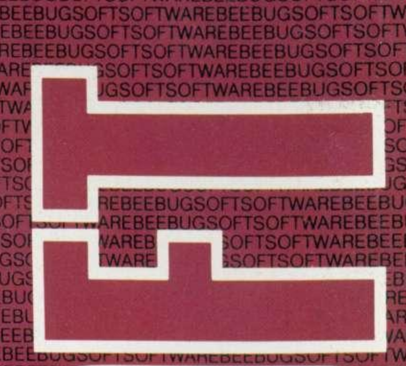


This pack automates the creation of an icon-driven user interface. It is supplied on a 16K Rom and allows you to design a screen containing icons and then use it in your own programs, in place of a normal menu.

It is easy to use and may optionally be controlled with the AMX mouse. Icons (sample sets provided) are designed on a special Icon screen editor and are compatible with AMX icons.

Having designed the icons, the next step is to select the Menu editor and design your final screen. You may position your icons and text wherever you choose on the screen. Icon Master then generates the code to append to your Basic program which will reproduce your icon screen and handle user input.

Your own icon-driven programs may be used with or without the Icon Master Rom in your machine.





ROMIT — Put your own Basic programs into Rom

CREATE YOUR OWN SILICON DISC

```
>*HELP ROMIT

*RAM        *SAVE      SAVE
*TRANSFER   *LOAD      LOAD
*ACCESS     *SPOOL     OPENOUT
*DELETE     *ITITLE    PRINT#
*RENAME     *IHELP     BPUT#
*SNAP       *DOWNLOAD  *MEND
*RELOAD     *UPLOAD    *PAD
*REXEC      *INFO      *PRINT

>*RAM
>*INFO

MY.PROGRAM L  FF1900  FF8023 1CDE  806C
MY.DATA       FF0C00  000000 0100  A223
!BOOT      L  000000  000000 007C  A341
!HELP         000000  000000 0044  A3D9

End of Rom: &A439   Free bytes : &1CC6

>*PAD
>*DOWNLOAD
Ready to blow ROM data at &1900.
>_
```

RomIt is a 16K Rom which adds a new feature to your BBC Micro — A Ram Filing System. This provides over 20 new commands which enable you to:

1. Create a silicon disc with its own filing system commands. Type ★RAM, then you can catalogue the "disc", save and load files to it, storing as many files as memory will allow. You will need sideways Ram to use this facility.

2. Put your own Basic or assembler programs (or any file) into Ram and then make them into Eproms. Whether it's your favourite game, your function key definitions or any program that you use frequently, you can now put it into Eprom so that it's always instantly available.

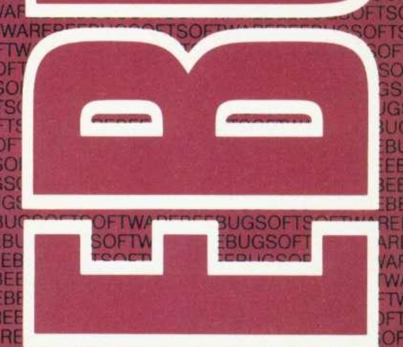
Your Eproms will work with or without the RomIt chip in your machine, and so you may pass on copies of your programs to other people.

Getting your own Basic program into Rom couldn't be simpler. Just load your program into memory and type: **★RAM ★TRANSFER "prog" ★DOWNLOAD** and either connect it to a blower, or send the disc (or tape) to us, together with your RomIt registration number, and we will Rom it for you. (There is a small charge for this service).

3. Use your sideways Ram as a printer buffer so that you can continue to use your computer for other work at the same time as printing long documents.

Over 20 new ★commands are provided by RomIt

To get the most from RomIt you will need sideways Ram fitted to your computer, eg just a single Ram chip plugged into your ATPL (or other) Rom board.



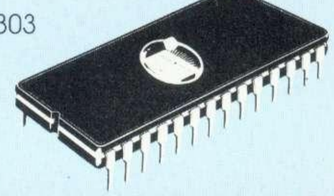
ICONMASTER £34.00 ROMIT £34.00 inc. VAT

Available from your local dealer. **Supplied on 16K Rom.**

For further information: Tel St. Albans (0727) 40303

24 hour Access & Barclaycard hotline
Tel Penn (049481) 6666

Mail order to
Beebugsoft, P.O. Box 109, St. Johns Road, High Wycombe, Bucks, HP10 8NP





TOOLKIT PLUS

BEEBUG SOFT

BASIC PROGRAMMING AID IN 16K ROM

A VERY SPECIAL PROGRAM

- Now in 16K
- Full screen Basic editor — Wordwise-like operation
- A host of new commands
- Unique syntax checker
- "⋆command" or menu driven
- Toolkit upgrades available



In the two years since its launch Beebugsoft's Toolkit has been chosen by many thousands of BBC users and established a reputation second to none. The launch of our new second-generation Toolkit is therefore something rather special.

Toolkit Plus is a 16K Rom which has been written from scratch making use of the latest programming techniques. It offers over 40 commands (grouped for ease of use) and some new and very exciting features, all of which may be called directly or from a menu.

TWO SPECIAL FEATURES

1 Syntax Checker. The first of its kind on the BBC. As you key in your program, Toolkit will draw your attention to syntax errors that may otherwise come to light only after many program runs. You may also pass complete programs through the checker.

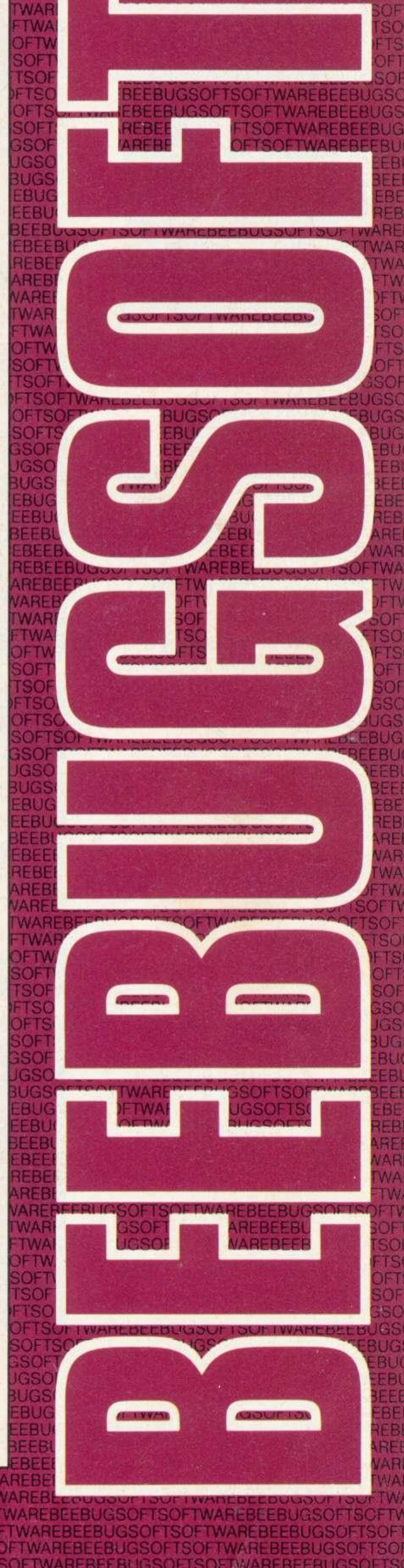
2 Basic Editor. A fully integrated full screen editor, comparable with Acorn's stand-alone Basic Editor, using "single key" commands for Move, Delete, Search etc all from within the on-screen editor.

OTHER COMMANDS

Autosave	Save programs at the press of a key	**Check**	Compare memory with disc/tape
Psave	Partsave any program section	**Function**	Function key editor
Xref	Powerful cross referencer to display values of variables, arrays, fns, procs, etc and their line numbers	**Envelope**	Envelope display
		Clear	Clear all variables
		Free	Memory status info.
		Duplicate	Copy program lines
		Erase	Delete program lines
Format	Flexible disc formatter	**Move**	Move program lines
Slomo	Program speed controller	**Look**	List file directly from disc/tape
Roms	Display & enable/disable Roms	**Renumber**	Flexible renumber
Crunch	Amazing Basic program packer. Beats the rest. (Removed 4,500 bytes from original Masterfile II)	**Memory**	Hex and Ascii memory display
		Merge	Combine 2 programs
Search	Flexible search & replace with 4 wildcards & special options (eg ignore spaces, Rems, case etc). Integrated with editor	**Relocate**	Move program in memory
		Recover	Recover "Bad Program"
		Report	Extended error reporting
		Screen	Screen save
Trace	Output to window with single step options	**Verify**	Disc verify
		Tools	Command summary
Error	Auto error detection	**Menu**	Toolkit menu

UPGRADE
Existing Toolkit owners may return their Rom and manual (mail order only) for a discount of £13.50

PRICE £39.00 inc. VAT. Available from your local dealer.
For further information: Tel St. Albans (0727) 40303
24 hour Access & Barclaycard hotline
Tel Penn (049481) 6666
Mail order to
Beebugsoft, P.O. Box 109, St. Johns Road, High Wycombe, Bucks. HP10 8NP



ACORNUSER

EDITOR
Tony Quinn

TECHNICAL EDITOR
Bruce Smith

SUB-EDITOR
Julie Carman

PRODUCTION ASSISTANT
Kitty Milne

EDITORIAL SECRETARY
Isobel Macdonald

TECHNICAL ASSISTANT
David Acton

ART DIRECTOR
Mike Lackersteen

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Liz Thompson

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NEW USERS

FIRST BYTE 53
Tessie Revivis rounds up the different types of memory expansion available for the BBC micro and Electron

HINTS AND TIPS 48
More advice for the not so expert Beeb and Electron user from Martin Phillips

YELLOW PAGES

PROGRAM LISTINGS 105
The listings for you to type in for programs presented in this issue plus details of what micros and second processors they work on

BUSINESS

ACORN USER GUIDE TO BUSINESS 127
Ten pages of news and features for users of Acorn computers in businesses

BUSINESS NEWS 131

MINDING YOUR OWN BUSINESS 135
Roger Carus presents the first in a three-part series on how to set up a business computer system

PACKAGE PROBLEMS 139
Your queries on the software available for the Z80 second processor are answered by Edward Brown

CP/M CORNER 141
Our regular forum for CP/M users hosted by Edward Brown and Richard Clement

EDUCATION

EDUCATION NEWS 147

CONTROL IN THE CLASSROOM 150
Chris Drage and Nick Evans' topic is robotics and control in schools

REVIEWS

GAMES AND SOFTWARE 171

GRAPHICS ROM 181
Acornsoft's latest offering comes under scrutiny

DDD BUSINESS SUITE 183

BOOKS FOR ELECTRON OWNERS 185

ROMS 187
The latest on the firmware front, plus books to help you make the most of the goods

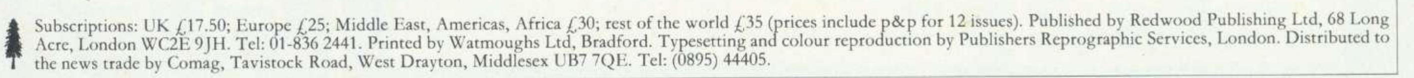
JOE'S JOTTINGS ON PLOTTING 195
Joe Telford turns his attention to two plotters

PRINTERS 201
How to choose the best printer for your needs, and a look at some books on the subject

RAM BOARDS 209
Chris Drage tests four expansion boards

REGULARS

News	7	Bar code reader offer	99	Beeb Forum	123
Noticeboard	18	Cassette subscriptions	100	Atom Forum	124
Letters	56	Graphics cassette offer	101	Software Charts	169
Central Processing	61	UserDump offer	102	Free ads	237
Dear Kitty	61	Listings cassette and disc	103	Small ads	239
Competition	93	UserRAM offer	121	Acorn Abuser's Diary	240

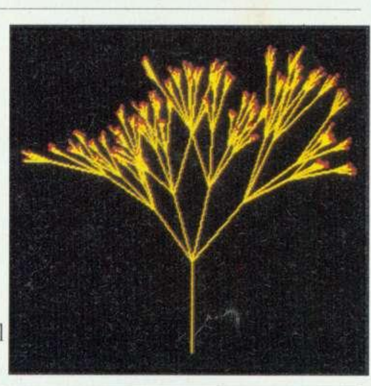

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FEATURES

SHUGGY'S GARDEN

73
Play this exciting action game by Hugh Darby and add a little extra fun to your Christmas

RECURSION EXCURSION



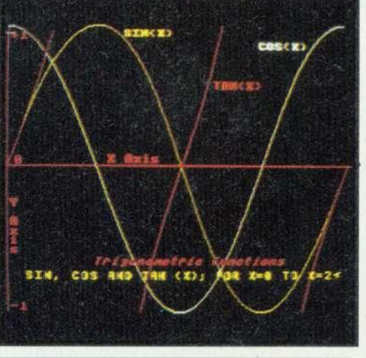
82
Jim McGregor and Alan Watt show you want you can do with fractal curves in your graphics

SCREEN COMPRESSION



89
Save high resolution text or graphics screens to tape or disc in the minimum of space with David Pilling's program

GENERATION GAME



94
You can generate lots of fancy typefaces on screen for the Beeb and Electron using Matthew Cook's listing

COVER

Cover illustration by Ken Laidlaw

NEXT MONTH

SUPER PAINTER
A superb printing and colour fill package
Writing programs for the BBC B+
Logo wordprocessor
Play Spectramania
3D graphics from Jim McGregor and Alan Watt
Keypads reviewed


FERGUSON TX
COLOUR CONTRAST BRIGHTNESS VOLUME


TX

A Ferguson that gives you double vision.

Hang on, are you seeing things?

In the top picture it looks like a portable TV. In the bottom picture it looks like a computer monitor.

The truth is that the Ferguson MC05 is designed to be the best of both.

It has RGB and Composite Video sockets, providing the shortest possible route for the signal to the screen, by-passing the circuits of a conventional television.

Whichever way you look at it, the picture quality is outstanding. And you can switch automatically between computer screen and normal TV screen, without having to change connections.

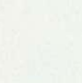
So why buy two sets, when you can get one that doubles up?

FERGUSON

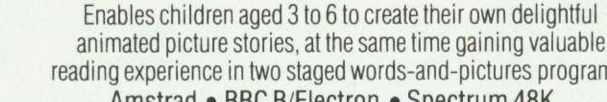
No-one is more switched on.



THE CHRISTMAS Mr. Men COLLECTION

MR MEN MAGIC STORYMAKER



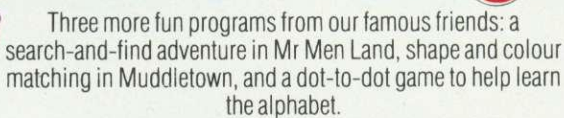
Enables children aged 3 to 6 to create their own delightful animated picture stories, at the same time gaining valuable reading experience in two staged words-and-pictures programs.
Amstrad • BBC B/Electron • Spectrum 48K
Cassette £9.95






THE INVISIBLE MR MEN

Three more fun programs from our famous friends: a search-and-find adventure in Mr Men Land, shape and colour matching in Muddletown, and a dot-to-dot game to help learn the alphabet.
Amstrad • BBC B/Electron • Spectrum 48K
Cassette £9.95




FIRST STEPS WITH THE MR MEN

Everyone's favourite first software package featuring Mr Greedy's Ice Cream Hunt, Mr Silly's Hat Game, and Mr Forgetful's Wardrobe and Letter Games.
Amstrad • Atari 48K • BBC B • Commodore 64 • Electron • MSX • Spectrum 48K
Cassette £8.95

HERE & THERE WITH THE MR MEN

Mr Tickle, Mr Grumpy, and Mr Lazy join forces with four fun 'mes to help children aged 5 and up learn about left and right, up and down, moving, and simple route planning.
Amstrad • BBC B/Electron • Commodore 64 • MSX • Spectrum 48K
Cassette £7.95

WORD GAMES WITH THE MR MEN

A bumper two-cassette pack featuring Mr Funny, Mr Silly, Mr Noisy, and Mr Bounce. Mr Noisy's Word Game introduces opposites and comparatives, and Read with Mr Bounce helps with positional words like in and out, over and under.
BBC B/Electron • Commodore 64 • Spectrum 48K
Cassette £9.95

All BBC B and Commodore 64 programs are also available on disk at £3 above the cassette pack price. We also operate a disk upgrade service for the same price.

The Mirrorsoft Mr Men Christmas Collection is available through BESA and other good software stockists everywhere.

In case of difficulty or for catalogues and product information sheets on our children's software range, please contact:

MIRRORSOFT

Maxwell House, 74 Worship Street, London EC2A 2EN. Tel: 01-377 4644 (24 hours)
Trade orders: Mirrorsoft Ltd, Purnell Book Centre, Paulton, Bristol BS18 5LQ

Welcome to our new-look pages

The new-look *Acorn User* marks the launch of a whole new range of services for readers and the confirmation of our determination to maintain the magazine's position as the market leader.

The past three and a half years have seen a steady increase in the quality of material in *Acorn User*, reflecting the growing expertise of you, the readers who contribute ideas and articles. Programs presented in the magazine have put many commercial offerings to shame, and some have actually been used by software houses. We aim to see that your submissions receive the attention they deserve.

We've improved the appearance of the monthly listings cassettes, and you can now take out a subscription to receive one each month. A similar service for discs is soon to follow. Micronet users can now download listings direct – free of charge. The use of Bar Code Readers is growing and with it booklets to speed program entry and save typing.

Your replies to our Reader Survey demanded more software from *Acorn User* and that is coming to light with *UserDump*, *UserRAM* and special program compilations proving very popular. And there will be more in the New Year.

Also you'll see a new focus with articles devoted to helping you use the micro for tasks in business and the home, rather than the micro using you!

Some readers have asked why we cannot include barcode listings and checksums in each issue. The answer is simply that there isn't space. What would we leave out?

The Reader Service is well used, and next month we'll give a rundown of the sort of questions we are getting – and help you ask your questions better!

Until then we'll leave you to discover the delights of the new style. All the old favourites are still here, and, we hope, some new goodies to grab your attention.

Atari's 16-bit school bid

Atari is set to attack Acorn's education market with a 16-bit machine which promises to be compatible with the BBC micro.



Can the Atari ST (left) loosen the BBC micro's (right) educational stranglehold?

The Atari 520ST was launched in the UK in September as an all-in system consisting of 68000 processor, 512k RAM, a monochrome monitor, 500k disc drive, mouse and bundled software. It normally sells at £749.

By the end of the month, 5000 STs had been sold and, according to the company, many of these went to schools. Atari hopes to build on this by releasing a BBC Basic interpreter before the end of the year, with all the Beeb's screen modes and compatibility at operating system level.

This would allow the machine to be used alongside BBC micros for teaching Basic programming in schools. Apricot adopted a similar tactic with the F1E 16-bit machine, but hasn't proved very successful.

There are also plans for a full 6502 emulation, which would allow the ST to run almost all BBC micro software. A Z80 emulator has already been written for the ST, allowng CP/M business software to be run.

Atari product manager Robert Katz claimed: 'The ST is taking over in schools because it scores over the BBC micro in two respects – speed and memory.

'It also has a networking capability and by Christmas we should have over 500 software titles for the ST – mainly third party.'

Bob Coates of Acorn's education division was unimpressed.

He said: 'Unless the ST can emulate the BBC micro's VDU commands the majority of educational and other software won't work.

'As well as graphics compatibility there's the question of media compatibility and the copy protection of BBC micro software.

'If the ST can overcome all these problems we at Acorn might take it seriously.'

Acorn is selling 3000-4000 BBC micros per month and some 2500 schools have Econet networks of these computers. Coates thought it unlikely that schools would switch to a network based on Atari machines.

And he claimed that marketing the Atari as a 16-bit business machine for schools would not be successful, as the machines had little educational use apart from in business studies.

Eltec, a major distributor of computers to retailers and to education authorities in the north of England, said: 'Everyone wants a large slice of the education market, but Acorn sales remain as strong as ever. We won't sell the Atari directly against the BBC micro – they're really for two different markets.'



Download to the Electron

Electron users will sooon be able to access Ceefax or Oracle to download telesoftware with a teletext adaptor costing about £150 from Morley Electronics.

The unit has its own power supply and plugs into the Plus 1 interface on the Electron. Software to control the system is built into the adaptor which comes in a case similar to the BBC micro version (shown above).

The Beeb's mode 7 is simulated by the adaptor, making it possible to play long adventure games.

Details form 1 Morley Place, Earsdon Road, Shiremoor, Tyne and Wear.

Mechanics by micro

Car owners can find and remedy faults on their vehicles with *Car Cure* from Simtron.

The software helps you diagnose the problem and suggests what action should be taken. It's database contains more than 300 symptoms and 900 faults.

Available for the BBC micro, it costs £9.95 on cassettte or £11.95 on 40 or 80 track disc from Simtron, 4 Clarence Drive, East Grinstead, W Sussex RH19 4RZ.

Mailbox bargain

Secondary schools using The Times Network for Schools (TTNS) can take up extra electronic mailboxes at £34 for the current academic year instead of the same price per term, before December 1985.

TTNS members will be entitled to one reduced price mail-only box for each full-price mailbox (£69 per term). They are intended for communication between headteachers, school administrators and their local authorities, as well as other TTNS members.

Software house abandons Beeb

by Geoff Nairn

A major software house has decided that the BBC micro has had its heyday. Computer Concepts, which specialises in serious ROM-based software, has announced it will abandon the Beeb and concentrate on the Atari 16-bit ST.

Computer Concepts made its name with the *Wordwise* wordprocessor and has a list of 15 Beeb titles. Two more are in the pipeline – *Interbase,* a sophisticated database program, and a new wordprocessor, *Interword* – but after these are released, in early 1986, there will be no new titles for the BBC micro.

Managing director Charles Moir said: 'We've stretched the BBC micro beyond the limit and we now need a more powerful machine.

'The Atari ST, like the Beeb in its early days, suffers from a dire shortage of software so we will concentrate on this one machine.'

He stressed that the company would continue to support those already using Computer Concepts' BBC micro software.

The company specialises in serious, upmarket software as opposed to games and this sector of the market is meant to be the most secure and stable for the BBC micro.

Indeed, other publishers of ROM software were more optimistic. Nazir Jessa, of Watford Electronics, commented, 'We have the largest range of ROM software for the BBC micro and we feel that the market is good for another two years.'

Adrian Calcraft, of Beebugsoft, said, 'We have some 30 titles for the Beeb, including eight to be released at Christmas. We are launching six programs for the Amstrad, but we have no plans as yet for the Atari ST, though we obviously review the market as new machines are released.'

MEP units scrabble for cash

The dismantling of the Microelectronics Education Programme (MEP) has left the specialist MEP development units scrabbling for cash while the Government apparently has money to spare.

The Microelectronics Support Unit (MSU) will take over from the MEP in April 1986 with a reduced range of activities and a smaller budget – £2.2 million as opposed to the MEP's £4.5 million this financial year.

Several of the seven national MEP hardware and software development units seem set to lose Government funding and will have to look elsewhere for their money – perhaps to Local Education Authorities, universities, commercial companies or other education bodies.

Yet the Treasury has apparently set aside £3.4 million for the MSU, even though the Department of Education and Science has only called on £2.2 million.

Mike Bostock, of the Applied Microelectronics in Education Unit at Newcastle, fears that the announced lower figure jeopardises the MEP's development role and, in particular, the very existence of his unit. He said: 'No money has been put side for development – just consolidation of existing products and software. It looks like our unit will be closing down.'

Over 40 countries have paid for MEP consultants to help set up similar computers in education projects overseas, and John Coll, manager of the Homerton College MEP software unit, feared that if the MSU abandoned the MEP's 'leading edge' activities, this source of income would dry up.

The Chelsea Project, which receives the largest share of funding of all the MEP national development units, is looking for funding from Kings and Chelsea Colleges, and university research councils. Its director, Margaret Cox, had yet to hear whether the MSU would provide any support to the project.

No-one from the Department of Education and Science was available to comment on the MSU's activities or the extra money.



Nightingale buyers could win US trip

Fly the modem

Pace has teamed up with Micronet 800 and Virgin Atlantic Airways to run a competition with a £1600 trip to the United States as the prize.

The competition is open to anyone who buys a Nightingale modem between November 1 1985 and February 1 1986. To enter you must take part in the Pace Round Britain Race currently on Micronet 800. Everybody who plays the game will go forward to the big draw to be held on March 1 1986.

For more details contact Pace or your local Pace dealer.

Logotron extras

Logotron has announced a set of extra facilities for its Logo package, including a control version of the language.

Advanced Logo comes on a disc at £15 (excluding VAT) and provides 40 new Logo primitives including a list processing kit for database writing.

Control Logo will work with many robotic devices.

Contact Logotron, Ryman House, 53 Markham Street, London SW3 4ND.

Videotext 'oscar'

Videotext users now have their own 'Oscar' style awards run by Prestel, Micronet 800 and Tecmedia.

All you have to do is create a videotext database of 10 to 30 frames, save it to disc and mail it to the organisers, c/o Tecmedia, 5 Granby Street, Loughborough LE11 3DU. Every month winning entries will be displayed on Prestel and winners will receive cash prizes and mounted certificates.


MATCH DAY
Match Day is no ordinary soccer game. Blistering 3-D action, total animation and automatic camera scan are just some of the intricate techniques which make Match Day the league leader of soccer games.
Now follow the "Action":
Your striker traps the ball from a perfectly placed corner-kick, takes on the defender and dribbles neatly round him making space to
chip in a teasing cross-ball to his advancing team mate in the
six-yard box. There is no time to control the ball, your player must commit himself to a snap shot on goal...
his powerful half-volley rattles the cross-bar, the ball returns, floating menacingly above the penalty
area and your star striker seizes this half-chance
to head the ball decisively into the back of the net... ...GOAL!
Match Day is as compelling as soccer itself. You will marvel at the depth of play and ball control offered only in MATCH DAY ... Shoot to win!
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ocean
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Ocean House · 6 Central Street · Manchester · M2 5NS · Telephone 061 832 6633 · Telex 669977
Ocean Software is available from selected branches of: WOOLWORTH, WHSMITH, Boots, John Menzies, LASKYS, Rumbelows, Greens,
Spectrum Shops and all good software dealers. Trade enquiries welcome.

Demon returns from the grave

The budget-priced Demon modem is now being sold through Walkbury Consultants, after the collapse of its previous manufacturer, Rushworth Dales.

Walkbury Consultants made the Demon under contract to Rushworth Dales, and has now bought up the stock from the liquidators and will manufacture and market the modem itself.

Martin Paine of Walkbury said: 'We will be producing exactly the same product, but with more emphasis on quality control.'

Walkbury will take over support for existing customers, but will make a standard charge of £10 for sorting out problems. The price of the modem has still to be fixed but it should be around £50.

Walkbury Consultants, Alfric Square, Woodston, Peterborough. Tel: (0733) 235187.

Up to scratch

Innovative Software has released *Scratchpad*, an 'ideas processor' program for the BBC micro. It's a cross between a wordprocessor and a spreadsheet – like a wordprocessor, text is entered once only and can be easily manipulated but like a spreadsheet, the user can try out different structures for the text.

It comes on disc at £24.95. You can call Innovative Software on (0792) 205678 ext 4219.



Acorn's Communicator is to be sold to original equipment manufacturers (OEMs) to customise for their own purposes

Communicator's wide appeal

The Communicator, Acorn's answer to ICL's One Per Desk, was due to make its first public appearance at the London Compec business show in November.

Unlike other Acorn micros, the Communicator will not be available through normal retail outlets, but will be supplied direct to OEM's (original equipment manufacturers) who will customise the machine hardware and software for their own business.

The Communicator should appeal to a wide variety of establishments ranging from multinationals who wish to build up a local area network of machines within buildings, down to travel and estate agents who could be linked together to form a huge database of holidays or homes.

The Communicator which takes up only 43 × 22cm of desk space has a full QWERTY keyboard incorporating separate number and function keypads. A matching telephone is also supplied. The calculator-type LCD (shown in *AU* October) will not be supplied as standard.

At the heart of this new machine is the 16 bit 65SC816 microprocessor which runs a specially developed multi-tasking operating system held in one of the four available 128k ROM sockets. A limited amount of software is offered including the *View* range, some demonstration packages and software development tools. It contains communications software plus an auto answer/auto dial modem.

Memory is expandable internally from 128k to 512k and may be expanded off-board via the expansion bus. Battery-backed memory is also present for the storage of vital data such as phone and account numbers.

Disc storage is offered as a separate unit holding two 3.5in floppy discs giving 1.2 Mbytes. The disc drive unit can also act as a file server for Econet.

OEM's can fit their own ROM-based software into the four internal ROM sockets. The onus will be on OEM's to write or commission for their needs but Acorn will provide support and assistance.

Morley spins 1Mbyte disc

Morley Electronics has produced a 1Mbyte RAM disc for the BBC micro which offers unlimited file names and rapid access. The memory is addressed as if it is disc drive number 4.

The unit comes in the same case as the Morley teletext adaptor and plugs into the 1MHz bus. A ROM-based operating system contains numerous utilities, including one to back up all the files to floppy discs.

Price should be less than £200. For further details contact Morley Electronics, 1 Morley Place, Earsdon Road, Shiremoor, Tyne & Wear.

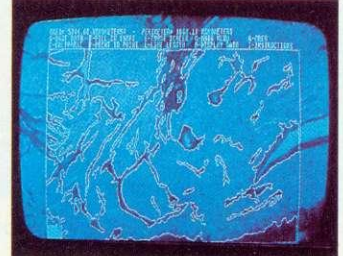
Beebs used to fight heart disease

BBC micros are hard at work at the Brompton Hospital in London helping to fight heart disease.

Five machines are being employed for a variety of tasks concerned with analysing different types of human tissue, including looking for cancer.

One Beeb is used for ultrasonic tissue characterisation and is hooked up to a sophisticated 100MHz waveform analyser and an ultrasonic imaging system.

In the pathology department an ABS graphics tablet and a BBC micro together measuring point-to-point distances and areas of tissues slices on histological slides.



Histology slide showing fibrosis in tissue, produced by system using BBC micro and graphics tablet

Another Beeb with a video camera detects scarred tissue within a slice, by means of photographic filters and grey-scale techniques.

Most of the software has been written in-house. Ron Logan-Sinclair, of the medical electronics department, said: 'In many instances it's far easier and quicker to develop an application on a BBC micro than on other more sophisticated computers.'



COMPUTER GROUP DISK DRIVES

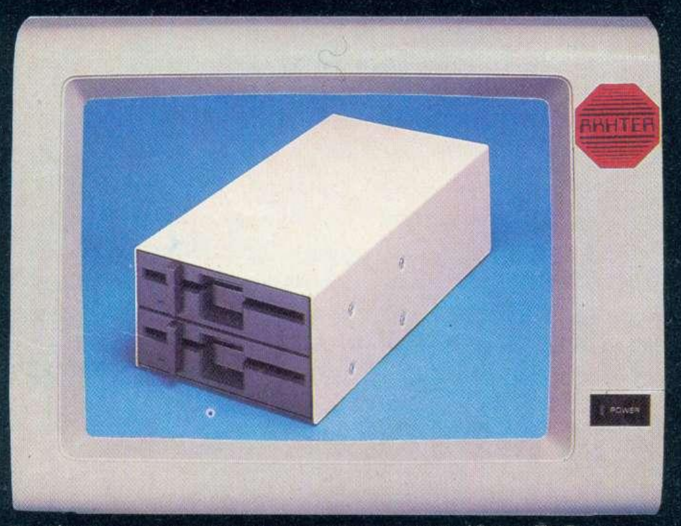
affordable computer solutions



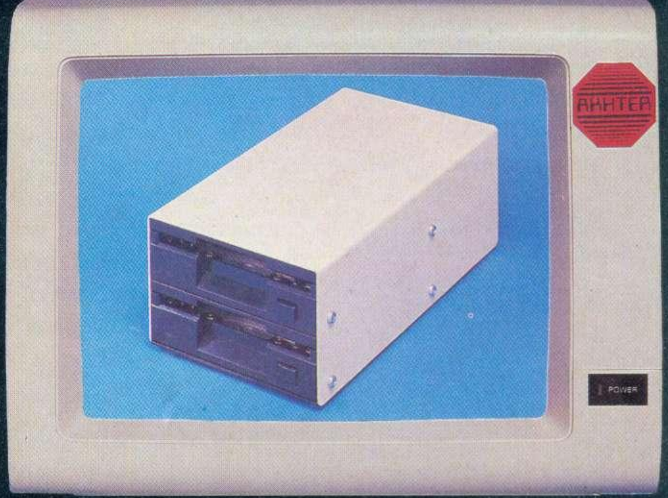
Dual 5¼" drives, with integral power supply. Horizontally cased in a metal stand. The ideal partner for your BBC & monitor. (Code suffix 'D' see opposite page).



Single 5¼" drive, with integral power supply, in a metal case. (Code suffix 'B' see opposite page).



Dual 5¼" drives with integral power supply in a metal case. (Code suffix 'E' see opposite page).



Either a single or dual 3½" drive, without power supply, in a metal case. Single version is fully equipped with cables for later expansion to dual drives. (Code suffix 'F' see opposite page).



Single 5¼" drive, without power supply, in a plastic case. (Code suffix 'A' see opposite page). Dual 5¼" drives, without power supply, in a plastic case. (Code suffix 'C' see opposite page).



Either a single or dual 3½" drive, with integral power supply, in a metal case. Single version is fully equipped with cables for later expansion to dual drives. (Code sufix 'G' see opposite page).

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Double-sided 800K (2 x 400K) 40/80 track switchable
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£234 + VAT £269

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(Housed in Plastic Case)

MD802C
Double-sided 800K (2 x 400K) 40/80 track switchable
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Double-sided 400K 40/80 track switchable
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5¼" NEW LOW COST DRIVE WITH 1 YEAR WARRANTY
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Double-sided 400K
40/80 track switchable
without PSU
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Vertically stacked dual drives
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3½ VERTICALLY STACKED DRIVES AT LOW, LOW COST WITH 1 YEAR WARRANTY

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Double-sided 400K
(single density)
800K (double-density),
80 track switchable.
Single drive, with provision for second drive to be added to the same case.
£99 + VAT £114

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Dual drives ready fitted in the vertically stacked casing
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MD802G
As 802F with power supply
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ACORN PRODUCTS

	AKHTER Ex. VAT £	PRICES Inc. VAT £
BBC MODEL B Plus with DFS	384	442
BBC MODEL B Plus with Econet	373	429
BBC MODEL B Plus with DFS and Econet	428	492
BBC MODEL B Plus, 128K version	418	481
6502 Second Processor	173	199
Z80 Second Processor	346	399
Winchester Disk Drive — 10 Mbytes	1304	1499
Winchester Disk Drive — 30 Mbytes	1999	2299
BBC Prestel Receiver	121	139
BBC Teletext Receiver	196	225
MODEL A to B Upgrade (incl. fitting)	90	103
Econet Interface (incl. fitting)	60	69
Disk Interface (incl. fitting)	103	118
New 1770 DFS kit	43	50
64K RAM Upgrade for Bplus	34	39
ADFS ROM	26	30
IEE Interface	284	327
Music 500	170	196
Speech Upgrade	48	55
EPROMER for the BBC (with software available on Cassette, Disk or ROM — please specify)	99	114
Acorn Bitstick	328	377
Acorn Bitstick, Multi-plotter Driver	69	79
AMX Mouse	75	87
Traker Balll	52	60
Grafpad	120	138
Games Paddles	13	15
BBC Software		
ISO-Pascal	50	58
Wordwise	35	41
Wordwise Plus	49	56
View	52	60
Viewsheet	52	60
Viewstore	52	60

ECONET ACCESSORIES

	AKHTER Ex. VAT £	PRICES Inc. VAT £
File server level one	209	240
Econet Starter Kit	85	98
Printer server ROM	42	49
10 Station lead set	26	30
Econet interface kit (incl. fitting)	60	69

TORCH COMPUTERS

	AKHTER Ex. VAT £	PRICES Inc. VAT £
Torch Z80 Disk Pack	564	649
Torch Z80 Drive Only	266	306
Torch ZEP 100 Second Processor	299	344

3M PRODUCTS

	AKHTER Ex. VAT £	PRICES Inc. VAT £
3M 5¼" DISKETTES		
Single-sided, double-density, 40 track	16	18
Double-sided, double-density, 40 track	23	26
Double-sided, double-density, 80 track	27	30
Head Cleaning Kit	12	14
3M 3½" DISKETTES		
Single-sided, double density, 40 track	28	33
Double-sided, double-density, 40 track	39	45
DISKETTE STORAGE BOXES		
3M FLIP N File (15 diskettes)	6	7
3M Locking diskette file (capacity 50)	18	21
Lockable storage file (capacity 100)	20	23

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SPECIAL EDUCATIONAL DISCOUNTS & BULK ENQUIRIES WELCOME.

Watford's Delta second processor fits inside Beeb

The expanding Watford Electronics is releasing four new products this month – a 4MHz processor board to speed up a standard BBC micro; a 128k RAM/ROM board; a *Wordwise Plus* utilities ROM; and a double density filing system for the BBC B+.

The 4MHz Delta board is a second processor with a difference – the board fits inside a standard BBC B micro, plugging into the existing 6502 microprocessor socket. A single fly lead needs to be fitted and the power leads from the power supply unit must be redirected via the Delta board.

Once installed the Delta processor, which is based on the 65C02 chip, will run your Basic and machine code programs at more than twice their normal speed.

The Delta board has its own 64k of RAM which works in parallel with the existing memory in the micro. The price of the Delta board is £113.85 inclusive of VAT and software is provided in a sideways ROM.

The Watford ROM/RAM board provides up to 128k of sideways RAM. The board plugs into the 6502 socket and has five ROM sockets on board in addition to those normally available on the BBC micro. There are eight 16k bank RAM. With the addition of a suitable Ni-Cad battery RAM may be battery backed.

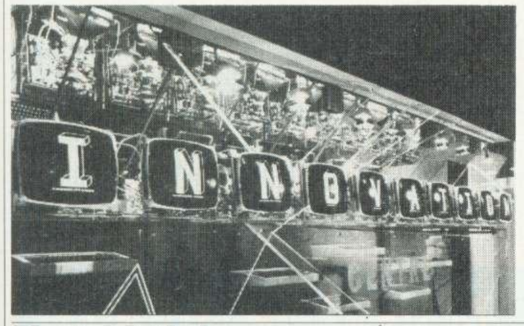
A plethora of software is provided on disc, designed to make using the board as simple as possible. The software includes a RAM Filing System which has all the facilities of a standard DFS.

Three ROM/RAM boards are available, with various amounts of RAM fitted priced as follows: 32k £51.75; 64k £79.35; 128k £125.35; 128k plus battery backup £143.73. All prices include VAT.

Word-Aid is a ROM-based suite of menu driven utilities for use with *Wordwise Plus*. It provides 11 areas of operation, including an alphabetical sorter, text transfer, chapter marker, printer codes, search and display, embedded command removal, multiple copies, continuous processing, mail merger, and utilities for use when writing Basic programs in *Wordwise Plus*. *Word-Aid* costs £13.80 including VAT.

Watford Electronics has also launched a 16k Double Density Filing System (DDFS) for the BBC B+. The most appealing of its many features are single or double density operation with automatic density detection; 31 or 62 file catalogue; and 8271 emulation for loading commercial software. The B+ DDFS costs £40.25 including VAT.

BBC micros star in design display



The Design Centre in London is using BBC micros at the heart of a dramatic entrance exhibition for its new innovation section. Each one of the 10 Beebs controls a monitor on which changing graphics are shown. This exciting display was created by the One Point Five design group and will become a permanent feature.

The BBC micro has already won a Design Centre award, and Acorn has submitted the Communicator for consideration for a similar accolade.

First birthday for Tubelink

Tubelink, the specialist database section of Prestel for second processor owners, is celebrating its first birthday.

Tubelink has more than 800 users registered and in excess of 700 pages – all due to its 15-year-old editor, Benjamin Rietti.

Tubelink is on page 258216 of Prestel and is free to Prestel Microcomputing subscribers.

£400 prize for software

Cash prizes are being offered in a software competition for schools organised by the University of Kent. Individual or group entries are allowed in junior and senior categories – the task is to write a piece of software with a practical use in industry or commerce.

The first prize for the writer is £400, with hardware worth £1000 going to his/her school. Three other hardware prizes totalling £1000 will be offered to the runners-up, as well as merit prizes ranging from £10 to £200.

Acorn User's technical editor Bruce Smith will be among the judges – others will come from the university, the sponsors Barclays Bank and industry.

Details from Kent Software Trophies, Computing Laboratory, The University, Canterbury, Kent CT2 7NF.

THE MAN FROM U.N.C.L.E.

Another Acorn machine sneaks onto the market in a blaze of reticence – the 128k 'Big Job' has been launched, despite rumours to the contrary. Ace marketing technique, eh? The review 'machine' delivered to *Acorn User* was a bare board which had to be soldered into an existing machine, impressive you must admit. They really know how to mould the opinions of the opinion moulders.

Still, they have announced the Risc chip and claim it is better than anything else in the known world. On past performance, the next step in the ladder is to forget all about it then go and invent something else.

Take heart though. I've just written (on the BBC micro of course) a machine code 'renumber' program for a poor soul who has the misfortune to own a Commodore 64. It's probably the feeblest machine I've seen, and makes me very grateful to both Acorn and the BBC, though it may not always sound like that.

Incidentally, rumour has it that Commodore may not be oppressing the masses for much longer. Even the very exciting Amiga, not working yet, may not save it and could actually be bought off it lock, stock and barrel by Somebody Else.

Speaking of Atari, its founder and ex-chief wizard, whose name escapes me for the moment, is having a second go at flogging robots. He has abandoned humanoids and is betting on metal moggies. It's true – you clap your hands and the ferrous feline will seek you out, purring as it goes. Clap again and it retreats into its hangar. Thank the lord Acorn didn't employ him. The Acorn Aardvaark could play havoc with the three-piece.



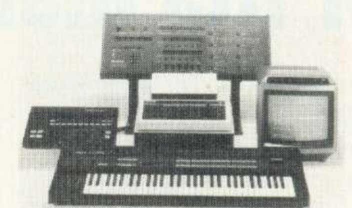
As we went to press the following companies had booked space at the show.
AB Designs, Acorn User, ACP Ltd, Advanced Memory Systems, Alien Software, Alphadisk, AVP Computing, BBC Publications, Blue Ribbon Software, Bowthorpe EMP Ltd, British Micro, Cambridge Micro Centre, Care Electronics Ltd, Careers & Info Centre, Carswell Computers Ltd, Central Trade Exchange, CJE Micros Ltd, Colisoft, Commotion, Communitel, Comsoft, Datac, Direct Disk Supplies, Disco Tech UK Ltd, Dudleys Deals, F Soft, GP Peripherals, Griffen Computers, Gultronics Ltd, HCR Electronic Services, Highlight Software, Hilditch Software, IDS Computer Supplies, Intergalactic Robots, John Wiley & Sons Ltd, Kansas City Systems, LCL Educational Software, Limbic Systems, Logic Sales Ltd, Logotron, London Rock Shop Ltd, Lothlorien, Marconi, Medstat Ltd, Mical Data Ltd, Microaid, Microdeal Ltd, Micro Media Computer Supplies, Microworld Computer Systems Ltd, Midwich Computer Company Ltd, Mineria, Miniature Tool Company, Modem House, Musitek, Network Group, Norwich Computer Systems, Opus Supplies Ltd, Paul Cocker PC Software, PB Computer Supplies, Private Tutor, Ramamp Computers, Ramco, Scriven & Rudge, Shards Software, Slogger Ltd, Solidisk Technology Ltd, Sunshine Publications, System Ltd, Viglen Computer Supplies, Walkbury Consultants, Watford Electronics, We Serve, Wigmore House, Willow Software.

Bargains galore on offer at Acorn User Xmas Show

Bargain hunters look set to make a killing at the Acorn User Christmas Show, where companies will be competing to give the best prices and secure a large slice of the Christmas market. The show will be held at the Central Hall, Westminster, November 22-23.

Despite the problems at Acorn and a lack of direction in the company's marketing, sales of expensive peripherals such as mice, disc drives, monitors and printers are running at an all-time high.

'There will be plenty of special offers to celebrate our 13th birthday this November', said Nazir Jessa of Watford Electronics. 'We'll almost be giving our disc drives away. For example you'll be able to buy the latest Mitsubishi twin 40/80 track drive with power supply and cables for £175 plus VAT.'


UMI from the London Rock Shop on show at Central Hall

Vig Boyd of Viglen – which was selling 800k switchable drives for £199 including VAT at the AU Exhibition at the Barbican this summer – was unwilling to be drawn on what the item would be selling for in November: 'It depends. They might go up, they might go down. Let's wait and see!' he commented.

However, Viglen will be showing its new casing for the BBC micro. It replaces the present lid and has space for disc drives and a metal platform to carry a monitor. It includes a remote keyboard casing, and will cost £39.

The show also features some of the smaller specialist suppliers, including the London Rock Shop which will be featuring the UMI digital recording system as used by pop stars Ultravox, Blancmange, Paul Hardcastle and Depeche Mode. Priced at £495, the UMI created much interest at the Barbican earlier this year.

Certified by disc

The City and Guilds, in conjunction with BBC Education, has introduced a self-assessment test on disc, leading to the 444 Inside Information certificate.

The scheme is designed to provide an introduction to information technology (IT) and is based around hands-on experience with the BBC micro and the BBC's *Inside Information* package.

There is no time limit to the test, where 24 questions are selected from a large database, ensuring each test is different. The computer marks the paper and successful candidates can send the disc containing their results to the City and Guilds which will issue the certificate.

A pamphlet detailing the syllabus costs £1.50 and a list of centres registered for the scheme is available. The *Inside Information* pack costs £26.95 from BBC Publications, 35 Marylebone High Street, London W1M 4AA. City and Guilds of London Institute can be contacted at Section 18, 46 Britannia Street, London WC1.

Atomic filing

Bear Hardware has released the Atom 1770 DFS designed to work with the company's AFDC hardware to control up to four drives. A utilities disc is available for users with single drive systems. An advanced systems disc is planned for early 1986. Details from Bear Hardware, 68 Harmondsworth Lane, Harmondsworth, Middlesex UB7 0AA.



Voltmace battery back-up with 16k of RAM fitted (left); Caretaker ROM in cartridge; 4k ROM in uncased cartridge; buffer box with two assembled cartridges in place.

Sideways cartridges slip in

Voltmace has released a cartridge system for sideways RAM and ROMs which sits outside the BBC micro. Batteries can be added so that programs saved in memory are not lost when the computer is switched off.

Chips are inserted into cartridges in a similar way to Acorn's Plus 1 system for the Electron. These then fit into one of two slots in the external box. Connection is made to the Beeb by a ribbon cable to the socket of the analogue chip.

The buffer box with cable and one ROM cartridge costs £29.95. Extra ROM cartirdges cost £3.50, with the RAM version priced at £9.95. Battery back-up adds £10 to the price of a RAM cartridge (prices do not include chips).

Details from Voltmace at Park Drive, Baldock, Herts SG7 6EW.

Christian aid

The Christian Micro Users Association aims to promote the use of micros.

The group produces a newsletter with listings and features on relevant topics and advertisements promoting products such as Christian teaching programs.

Articles include a progress report on keying in an Old Testament translation. CMUA is at 138 Bramwell Gardens, Sheffield.

Hams tune in to software

A father and son have got together to produce software for radio hams using BBC micros.

The first program is designed to control the YEASU 757GX transceiver and allows up to 300 station frequencies to be checked.

Details from G3LIV and G8UEE, or from J Melvin at 2 Salters Court, Gosforth, Newcastle.

Icon ROM from Beebugsoft

Macintosh-style menus can be created by *Icon Master* from Beebugsoft, which automatically generates the code to link screens you have designed to standard BBC micro software.

The icon symbols are designed by a special editor and are compatible with the AMX mouse and the rest of the software. The ROM costs £34.

Two other releases are *Romit*, a collection of sideways RAM utilities and *Studio 8*, which converts the Beeb into a 'four voice synthesiser with an eight track recorder and rhythm and drum machine'.

The *Romit* ROM costs £34 and *Studio* disc £22.

A third version of *Spellcheck* is now out on a 16k ROM for £36, while *Toolkit* has been upgraded with Basic syntax checker and editor, to become *Toolkit Plus* priced at £39.

Acorn User Reader Services

AS a result of pressure from readers, *Acorn User* has decided to launch a guaranteed fast reply service for enquiries. Your answer will be returned within five working days for just £2 (includes VAT), or your money back.

The idea is simple. Just write out your problem, fill in the coupon below, and send both off to *Acorn User* with a stamped addressed envelope and cheque or postal order for £2. (If you want recorded delivery, add the cost of this on. The same goes for overseas readers.) Make sure you include as much detail as possible and a disc or cassette if a program is involved – with enough space to record any corrected listing.

We will then answer the problem and return all material received – within a guaranteed *five working days* from receipt – in the sae. If we fail to match this promise your cheque or postal order will be returned with the answered question.

If we cannot answer the problem, the cheque will be sent back to you.

This service has been set up because so many readers want a fast answer, which we do not have the staff to provide. Under this new system, special technical staff will be available who can give the fast, guaranteed turnaround required.

NB. Please give details of machine, Basic,DFS, operating system, any extra internal hardware, etc, if known.

Whether you want a listing debugged, advice on hardware or software, or a list of addresses, send your problems to Reader Services, Acorn User, 68 Long Acre, London WC2E 9JH.

- -

ACORN USER READER SERVICE
68 Long Acre, London WC2E 9JH

Name ....

Address ....

....

....

.... Postcode ....

Daytime phone number...

I enclose a cheque/postal order for £2 and an sae with my problem.

OFFICE USE ONLY Date in:
Date out:
Answered by:

NOTICE BOARD



AU contributor astronomer Heather Couper's TV series *Planets* goes out on Saturdays on Channel Four

ON TELEVISION

● AU contributor Heather Couper gets her own astronomy series, *Planets*, on Channel Four starting this month. The series uses sophisticated computer graphics to create a solar system and simulate the experience of travelling through space.

Information acquired from recent space probes is used to explain the Earth's immediate neighbours in space to a wider audience.

Planets consists of seven programmes and goes out on Saturdays at 7.30 pm, starting 9 November. Heather Couper devised the series and will also present it.

Micro Live continues its run of live weekly computer shows on BBC2, culminating in a Christmas special which will go out on 13 December, featuring a special report from the US on computers and fractal geometry, plus a buyers' guide to suitable presents for micro enthusiasts.

Other programmes of interest this month include items on IBM's dominance of the PC market, a computer museum in Boston, USA, and how to write a commercial games program.

Micro Live goes out on Fridays on BBC2 at 7.30 pm.

ON RADIO

● *Inside Information*, Radio 4 VHF, Sundays 4.30 pm. A series of 10 weekly broadcasts which form part of a self-learning package about information technology. An audio tape of edited radio programmes is also available.

Further details given from BBC Publications at the address given below.

TO CONTACT

● Acorn (0223) 245200.

● Acorn's own bulletin board service is Prestel-compatible (1200/75) and runs on (0223) 243642.

● BBC TV's *Micro Live* bulletin board is on 01-579 2288 (type INFO BBC on Telecom Gold electronic mail system).

● BBC Publications has launched a public viewdata service, Owltel, offering information on the BBC computer literacy project and its range of software and computer books. Credit card orders can be made on-line and messages can be sent to Owltel. The phone number for the service is 01-927 5820. Write to: BBC Publications, 35 Marylebone High Street, London W1A 4AA.

● BBC Computer Literacy Project, Broadcasting Support Services, PO Box 7, London W3 6XJ. Send sae.

● British Telecom's Home Computer Line offers a short bulletin of hardware, software and general news. At present it's only available in Bradford, on (0272) 722622, and Belfast, on (0232) 8085.

● Bulletin Boards: CABB 01-631 3076; CBBS London 01-399 2136; Distel 01-679 1888; Forum 80 Hull (0482) 859169; Forum 80 London 01-399 2136; HAM-NET (0482) 497150; Liverpool Mailbox 051-428 8924; Mailbox 80 (0384) 635336; Technomatic 01-452 1500; TBBS London 01-348 9400; TBBS Nottingham (0602) 289783; TBBS Southampton (0703) 437200.

● MEP (Microelectronics Education Programme), Cheviot House, Coach Lane Campus, Newcastle-upon-tyne NE7 7XA. Hardware and software support for schools. Please send sae.

● MAPE (Micros and Primary Education), c/o Barry Holmes, St Helen's Primary School, Bluntisham, Cambs. User group for primary teachers. Send sae.

● MUSE (Micro Users in Schools and Education), Freepost, Bromsgrove, Worcs B62 7BR. User group for teachers and parents. Please send sae.

● National Extension College, 18 Brooklands Avenue, Cambridge CB2 2HN. Educational and training courses on the BBC micro. Please send sae.

● CET (Council for Education Technology), 3 Devonshire Street, London W1N 2BA. Government body which overseas MEP. Please send sae.

ON SHOW

● 14-17 November, Electron & BBC Micro User Show, Royal Horticultural Hall, London. Details 061-456 8383.

● 19-21 November, Tor Business Computer Centre Exhibition, South Devon College of Arts & Technology, Torquay, Devon. A welcome chance to mention an exhibition which, for once, is not being held in a large city. Covers small business applications of computers. Details on (0803) 217519.

● 22-23 November, Acorn User Christmas Show, Central Hall, Westminster, London. Enjoy Christmas a month before everyone else. Details 01-346 6566.

● 14-17 January 1986, Which Computer? Show, National Exhibition Centre, Birmingham. Details on 01-891 5051.

● 22-25 January, High Technology and Computers in Education Exhibition, Barbican, London. 01-349 4667.

FOR HELP

● To contact Acorn User authors, write c/o the editorial address given on page 2.

● Monitor choice: Photocopies of the review of four monitors, plus a set of nine test programs from the June 1984 issue cost 72p (including postage). A copy of the issue costs £1.25.

● Bulletin boards: Information on 26 free-access boards was given in the October 1984 issue. Send 54p for photocopy.

THE ESCAPE ROUTE

Almost all dot-matrix printers use escape codes to select printing style, whether it's the character set, underlining or NLQ print. Converting the ESC code given in the manual to a useable form is straightforward.

For example, the Epson manual states that to select italics we use ESC 4. The ESC character is always 27 (this is its ASCII code). The next step is to take the ASCII code of the number that follows – in this instance for the number 4 it is 53. Therefore we need to send ASCII characters 27 and 53 to the printer in that order. In Basic this is done using a VDU 1 before each character, thus we send:

```
VDU 1,27,1,53
```

The printer should have been enabled first though with CTRL-B or VDU 2, and then disabled with CTRL-C or VDU 3. Some ESC codes take three values. For example the pica sized print mode is selected with ESC B 1. In this case we proceed as described for the first two characters and then use the third as it is. ESC becomes 27, B becomes 66, 1 remains as 1. So the VDU sequence is:

```
VDU 1,27,1,66,1,1
```

The back of the user guide contains the ASCII code values for each character.

If you're closing in on Hunt at Silverstone, look what's coming round the corner.

Compared with the tension and realism of REVS, other motor racing programs are left at the starting grid.

The press heaped winner's laurels upon it.

Devotees are clamouring for further challenges, having progressed from Novice to Professional class to come within sniffing distance of the 1 minute 24.6 secs lap time at Silverstone of co-author and Formula 3 racer David Hunt.

So we've gone four times better. We've brought you Donington Park, Brands Hatch, Oulton Park and Snetterton in the new REVS 4 TRACKS pack, for use in combination with the original program.

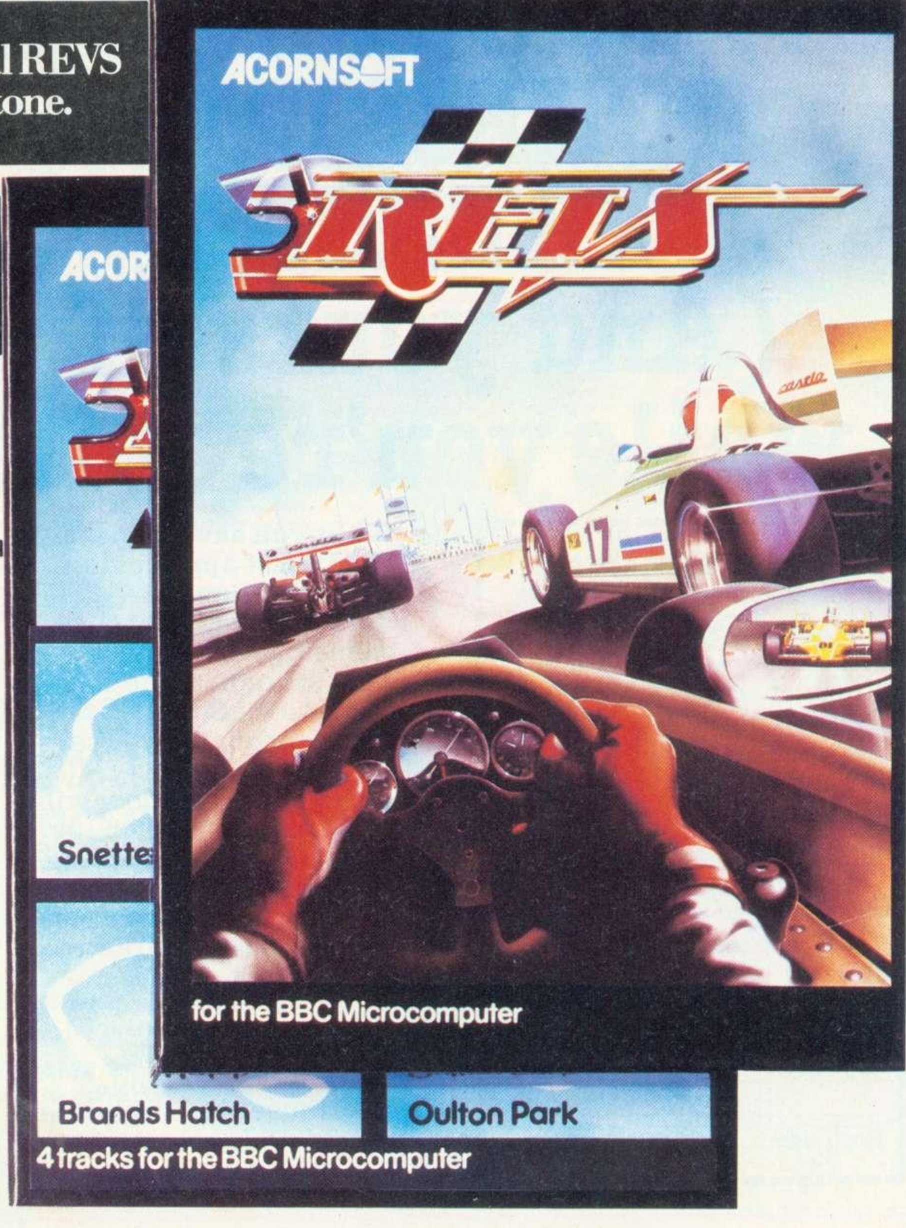
Every bend and brow of these renowned tracks is faithfully recreated, with the ever-present threat of your race rivals looming in the rear view mirror. And don't think for a minute that mastery of one track is mastery of all. Each of the four circuits presents a whole new set of problems to conquer.

If any reader is contemplating these four plus original REVS as a bumper Christmas package, be warned. The experience and the turkey might not agree.

For the address of your nearest Acornsoft dealer, or to order REVS on credit card, call 0933 79300 during office hours. Or send the coupon below to Acornsoft, c/o Vector Marketing, London Road, Wellingborough, Northants NN8 2RL, allowing 28 days for delivery.

The Original REVS at Silverstone.

New REVS 4 TRACKS adds challenging new circuits.



To: Acornsoft, c/o Vector Marketing, London Road, Wellingborough, Northants, NN8 2RL

Please send me REVS 4 TRACKS for the BBC Microcomputer. (Remember, you need original REVS.)

No. of discs at £12.95 inc VAT ______

No. of cassettes at £9.95 inc VAT ______

Please send me REVS for the BBC Microcomputer.

No. of discs at £17.65 inc VAT ______

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ACORNSOFT

To be sure of delivery in time for Christmas, your order must be with us by Monday 16th December.

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Central Hall, Westminster, 22nd-23rd November, 1985.

Today's the day to get your Christmas shopping started!

Because today's the day we're announcing a new Christmas computer event – the Acorn User Christmas Show. And the coupon below brings you straight-past-the-queue advance tickets ... saves you £1 or more on the entrance money ... and *automatically* enters you into the draw for Acorn products worth £500! It's the only way we know to make Christmas shopping fun.

When? And where? And who?

The Acorn User Christmas Show is on Friday and Saturday, 22nd and 23rd November, at The Central Hall, Westminster.

The Central Hall is near the Houses of Parliament. It's easy to get to, and it's big to make a really busy show comfortable. (Who needs another West End crush?)

There'll be the most comprehensive range of hardware and software – for business, education, scientific and home use.

The list of exhibitors is growing daily. Like visitors, they had a great time in July, and they're looking forward to launch their latest products.

GIVE YOUR ACORN A CHRISTMAS PRESENT (And yourself while you're at it!)

TICKET APPLICATION FORM

To: Edition Scheme Ltd,
HR House, 447 High Rd,
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Please supply ____ (qty) adult tickets at £2 (if total bookings are less than 10) or £1 (if total bookings are more than 10)

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What you save by posting the ticket application coupon today.

For everybody ... cut out the queueing! Ticket holders walk straight to the door and into the Show.

For individuals ... you save £1 per head on entry. Admission at the door will be £3 per head for adults, £2 per head for under-sixteens.

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TELEPHONE: 061-834 3939



ROMS



The Definitive Random Access, 24K ROM based Database Management System for the BBC B and BBC B+.

"Excellent if you can afford it..." (ACORN USER Dec. '84)

Now compatible with most double density DFS's

Now You Can! ~~£129.95~~ £79.95

DATAGEM

Long hailed as the most comprehensive and powerful database for the BBC, and now becoming a legend in its own right, DataGem has been significantly reduced in price now that development costs have been recovered by Gemini. Whether you have a single 40 track drive or a Winchester hard disk, this system will make use of ALL your disk space, treating up to 4 drive surfaces as ONE CONTINUOUS FILE. Much has been made and exploited of DataGem's superb selective searching capability, and together with its unmatched mathematical powers, the system provides a really professional database for use in the home, office or school that will harness the full power and potential of the BBC micro.

AMATEURS & PROFESSIONALS

For newcomers to databases as well as seasoned users, DataGem represents an ideal starting point. Structuring your file and layout couldn't be simpler using DataGem's on-screen 'painting' format. You can have up to 62 fields or data items wherever you want them on a scrolling 120 x 120 card. Colours are all definable, and field data and field titles may be separated if required. Data entered may be stored in up to 8 tiers or 'levels', as well as within the whole database file. Scan one level or the whole database for records that match your search parameters, and place them in another data level for later manipulation. DataGem also boasts limited facilities for producing data merged letters, and may be configured as a 62 cell spreadsheet.

TECHNICALLY SPEAKING

The System Comprises:-

1. 2 EPROMs mounted on carrier board containing 24K of 6502 optimised machine language. Carrier board may be inserted in either of two positions under keyboard or in sideways ROM board.
2. Demonstration applications disk in both 80 and 40 track format with documented examples of DataGem files. Disk contains no DataGem program code.
3. Full colour packaging consisting of A5 ring binder with professional documentation, user registration card and quick reference card.
4. Utility program named 'Trans' also supplied to allow transference of data files from all other Gemini databases.

The System Features:-

- Permits just ONE file to exist over FOUR floppy disk drive surfaces with a maximum file size of at least 10 Megabytes.
- Allows up to 5100 User Definable Records.
- Maximum number of 62 fields per record, which may be any combination of the following types:-
  STRING – Up to 120 characters long
  DATE – Either two or four digit year dates may be selected.
  TEXT – A field with no data, allowing background text to be placed anywhere on the record. This may then be altered/moved/deleted, even after the database is in use. Up to 3000 characters of background text may be placed on the record in this way, enough for limited word processing and mail-merge.
  NUMERIC
- Allows searches on any field or COMBINATION of fields to ANY depth.
- Up to 9 subsets of data INSTANTLY available and saved to disk automatically.
- Sorts alphabetical or numeric on any field, ascending or descending with NO LIMIT on the depth of sort.
- Interfaces with 'VIEW' and 'WORDWISE'.
- Includes a free format report generator for a completely flexible printing format.
- Allows the user to extend the file or add fields after having started to enter data.
- Offers a free format painted screen which scrolls 120 x 120, and supports extensive mathematics.
- Provides User defined field relational variables and multiple and single character wildcards.
- Exists self contained on ROM, and does not require additional utilities on disk.
- Finds the occurrence of a string or partial string in ANY field in the database with just one command.
- Mathematical Operators
  +, –, ★, /, multilevel parentheses (up to 50 levels), unary negation.
- Logical Operators
  >, <, >=, <=, <>, =, ★(AND), +(OR).

WHAT OTHERS SAY

DataGem provides many of the Spreadsheet facilities of an item like Lotus 1-2-3... Combined with a Word Processor, it forms the basis of a very competent small business system.
Personal Computer News – July 1984.

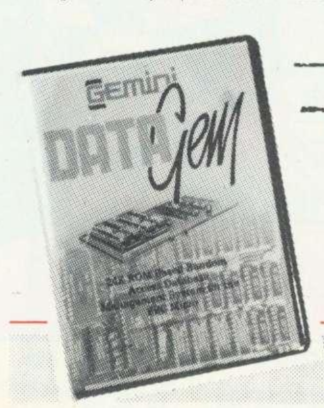
DataGem stands out in terms of both price and performance. Excellent if you can afford it.
Acorn User – December 1984.

NEW DATAGEM GUIDE

Available separately to existing owners of DataGem (see below), this new and comprehensive manual has just been completely re-written by Simon Williams, a veteran press reviewer and writer. The new guide takes you step by step through all the facilities of the program with worked examples, and without any requirement for a previous knowledge of databases. It contains over 40,000 words and is fully indexed.

MONEY-BACK GUARANTEE

The power and facilities of DataGem are just too great to detail in this advertisement. As the product is protected against unauthorised copying, we are able to offer our no-quibble money-back guarantee to customers purchasing DataGem direct from Gemini. If you don't agree that it's worth the price, send it back to us undamaged within 7 days of purchase for ANY reason and we'll refund your money – immediately.



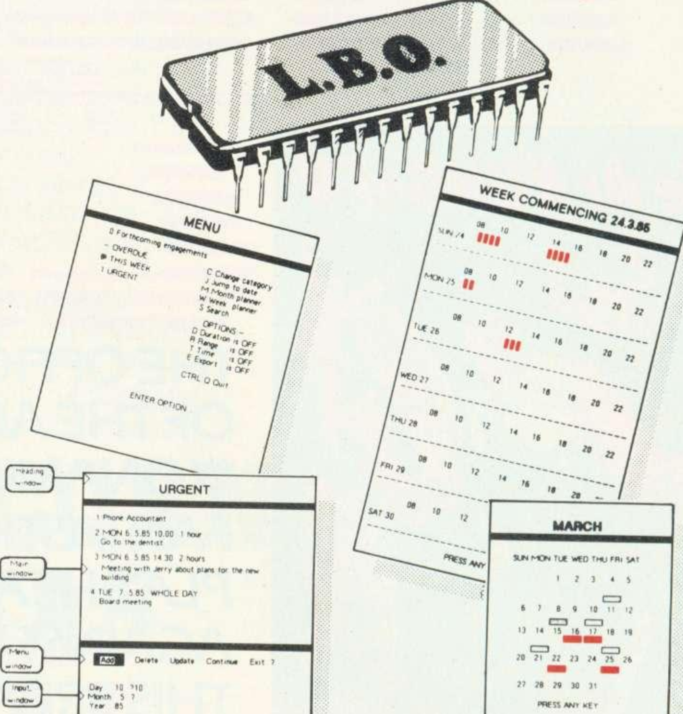
STOP PRESS!!

New DataGem owner's manual (see above) available separately at **£12.95** inclusive

Price refundable against purchase!



– the ULTIMATE BBC utility!



A NEW & EXCITING ROM RELEASE FROM GEMINI

This is a comprehensive life and business organiser package in 100% machine code which has been very carefully designed to provide a wide range of useful facilities for the busy person at home or in the office, and is simplicity itself to use. Once you start using LBO, you'll ALWAYS use it – not like one of those ROMs you only occasionally call on. LBO will put an end to forgetfulness and ensure that your time is organised, you know what you have to do and when, you don't forget bills or birthdays, and you are reminded constantly of urgent matters.

LBO was written by two graduates in Computer Science from Exeter University in consultation with a lecturer in Cognitive Psychology. It has been very cleverly researched and programmed and is confidently recommended by Gemini as a very superior program for the very superior BBC micro.

Features include:-

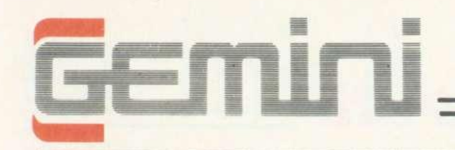
- Automatic reminder of entries overdue for attention
- One week's advance notice of forthcoming events
- Urgent notice board
- Creation of categories of entries; e.g. bills, birthdays, letters to be written, notepad etc.
- Sorting of appointments by date and time of day
- Month AND week's summary at a glance, indicating time booked and free
- Single entry of a RANGE of events and updating of regular happenings
- Super search facility to call any event by any related word or part word
- Month by month preview of all forthcoming events
- Built-in intelligent calendar
- All data saved to disk
- Full printer support
- Easy to follow documentation

Use LBO to organise your life from today until 1999! It can handle literally hundreds of multi-line messages, as many as you are every likely to need. Despite the very wide range of facilities offered, this professional program is VERY easy to use and requires absolutely NO knowledge of computers. A vital aid to your everyday life, LBO is GREAT FUN TO USE!



L.B.O. only **£19.95**

Also available on DISK for those with a cluttered ROM board – £19.95.
QL version also available now, MS-DOS version early 1986.





With over four years experience of providing practical software solutions for business and home applications, Gemini have put together a selected range of famous titles for the BBC and BBC Plus in TWO special packs, at VERY SPECIAL prices. These super value packs contain all the serious application software you're ever likely to need for your BBC, from spreadsheet and database management to a complete professional business accounting system. Gemini's 'OFFICE MATE' and 'OFFICE MASTER' packs are here – put that computer to WORK!



• DATABASE • BEEBCALC SPREADSHEET • BEEBPLOT GRAPHICS • WORD PROCESSOR • FULL DOCUMENTATION

DATABASE

Use this program for storing all types of information just the way YOU want to store it. You set up a computerised 'card index' system and add records and data to the file in the format that you choose.

Advanced features include sorting and searching for specific records, mathematical calculations, printer routines, data summaries etc. If you don't have a database, you certainly should!

BEEBCALC SPREADSHEET

Perhaps the most commercially successful item of business software yet written, the Gemini Spread Sheet processor offers a very wide range of invaluable calculation and editing features.

Consider, for example, a Cash Flow forecast containing rows and columns of figures, combined with text and numbers. If say, the cash receipts for January need to be changed, it would normally be necessary to delete and recalculate several figures for each successive month.

With BEEBCALC, however, an 'on screen' amendment to the January figure is made, and the corrected figures for each successive month automatically appear upon touching the 're-calculate' key.

Formulae cells in the table may be specified which relate to each other and then copied RELATIVELY or ABSOLUTELY to other parts of the program, which in itself is modular, and directly linkable to other Gemini programs. BEEBCALC has a complete range of inbuilt data entry and formatting techniques, and the structure of the table may be amended at any stage. Of course, full printer facilities are included which allow for either the table to be printed or just the data and formulae relating to the table. Another important feature, any valid BBC BASIC formula is acceptable as data entry making the system immensely powerful and versatile. BEEBCALC's sister program, BEEBPLOT, will take data from disk or tape files created by BEEBCALC to provide data portrayal in graph, histogram or pie chart format.

BEEBPLOT Graphics

Written specially for use with the BBC micro, this program makes full use of the high resolution colour graphics to provide an easily assimilated visual representation of numerical data.

For example monthly sales statistics comparing two year's results may be instantly converted into two side by side pie charts, histograms or graphs ... for easier visual comparison and assimilation.

BEEBPLOT also incorporates a built-in machine code screen dump, enabling a high resolution printed image to be produced using an Epson or similar bit image compatible printer. It also interfaces with other Gemini programs such as Beebcalc and Cash Book and is particularly recommended where any kind of mathematical plotting facility is required.

WORD PROCESSOR

This program provides many routines found in large and more expensive packages. With a typical word length of 5-6 letters it allows for up to 1000 words in memory at one time and is ideal for the user who wishes to write any kind of business letter on a home computer.

Features include: block delete, block insert, search and replace, edit text, display text, and many more.

Step up to Office Mate and save money!
(Price if purchased individually - £79.80 – save £67.80 with this pack)
Electron version available, pack contains Database, Beebplot, Beebcalc, Home Accounts, Cassette only.

OFFICE MATE £12 Cassette or Disk



• CASH BOOK • FINAL ACCOUNTS • MAILIST • EASILEDGER • INVOICES & STATEMENTS • STOCK CONTROL • FULL DOCUMENTATION

CASH BOOK

Gemini's CASHBOOK is a complete 'stand-alone' accounting software package for the cash based sole trader/partnership business. It is designed to replace your existing cash book system and will provide you with a computerised system complete to trial balance.

Simple to use, this program will replace your manual cash and bank records and provide vital management information at any time. It will take you from sheaves of invoices and cheque book stubs to trial balance, and may, if desired, be used in conjunction with the Final Account program.

Typical information from CASHBOOK is as follows: **1.** Summary of VAT information to enable completion of VAT returns. **2.** Cumulative receipts and payments report analysed over the standard profit and loss and balance sheet headings. **3.** Option for departmental analysis of sales and purchases. **4.** Printout of all transactions, nominal account balances etc. **5.** Journal routine for entering transfers between accounts and year end adjustment for debtors, creditors, etc. **6.** Trial balance. **7.** Full audit trail facility.

This program is recommended not only for businessmen, but also for practising Accountants for use in the preparation of Accounts from incomplete records; a printer is essential.

FINAL ACCOUNTS

Requires Gemini 'CASHBOOK' module (except Commodore 64 version)

This program will take data prepared by your Gemini Cashbook module and produce a complete set of accounts for you in the following format: **1.** Trial Balance with inbuilt rounding routine. **2.** Notes to the Accounts. **3.** VAT summary. **4.** Profit and Loss Account with comparatives facility. **5.** Balance Sheet with comparatives.

All reports may be produced at any time interval comparing actual to budget if required.

MAIL LIST

Gemini's Mailist program will enable you to keep a record of names and addresses and then print, examine, sort and find themn, all with special selection techniques. All our mailists contain our exclusive 'SEARCHKEY' system, giving you the option of creating your own dedicated coding system for each name on file. For example, on most mailing list systems, you are only given the standard heading such as name, street, town, country, postcode etc. With the Gemini searchkey system, you could find, say, all names on the file that are companies having a turnover in excess of '50,000' or all names that are subscribers who are behind in their subscriptions or all names that are eligible for a Christmas card this year!

A full and useful range of routines is included in the menu, and the program allows you to set up your own format for printing labels, i.e. the tab settings you require and spaces between labels, etc. Multiple copies can also be printed.

EASILEDGER

Contains routines to enable the small business man to keep a record of one of the most important aspects of his business – cash flow.

EASILEDGER is essentially a debit/credit ledger system which can handle sales, purchase and nominal ledger routines to provide instant management information. Its flexibility lies in its ability to produce account balances instantly for debtors and creditors, together with a record of all transactions, dates and references. A year-to-date summary of sales, purchases, receipts and payments over the twelve month period is also provided, as is a complete INTERACTIVE bank account database.

EASILEDGER is a management aid software tool and is designed to run alongside an existing accounting system. If you operate a cash based business and require a complete accounting package to produce the accounts to trial balance and beyond then we recommend you consider using both Easiledger and Cashbook programs together.

INVOICES & STATEMENTS

The Gemini INVSTAT program greatly reduces the time and cost of preparing Invoices and Statements by storing essential information such as customer names, addresses and account numbers, VAT routines and footer messages such as 'Please remit by return', 'Overdue and outstanding', etc.

Not only are Invoices and Statements produced more quickly and accurately, but pre-printed forms for them are eliminated since the INVSTAT program produces professionally formatted documents using your own printer.

STOCK CONTROL

You have a stock of products. With the Gemini program you may enter details of each product on to a record card on the computer with details of your own existing part number (if any), a description of the product, the unit quantity (i.e. one, a gross, a pair, etc.), the cost price per unit, the selling price per unit, a specified minimum satisfactory stock level, units in stock ordering quantity and supplier details.

The program will allow you to enter stock received, stock out, and will also give you a summary of stock items and current holding, together with details of total cost of stock, total sales value of stock, current gross margin on stock, cost of bringing stock up to minimum level, understocked items, etc.

Each stock item has its own computerised record and you may browse through the file as a whole, or just a specified number of records. An extremely powerful program, highly recommended for inventory control in small and medium sized businesses.



Gemini INTEGRATED ACCOUNTS & HARDWARE

WHY INTEGRATED ACCOUNTING?

Because it will retrieve information stored in one program for use by another, and store data in one program which has been generated by another.

This means that the scope for human transposition error is virtually eliminated ... for example, when typing an invoice manually, the typist could type £14.25 instead of £41.25, and undercharge the customer. Such an error cannot occur with integrated, computerised invoice generation, since only the part number needs to be entered and the price (and product description), are taken AUTOMATICALLY from the Stock Control program, and printed AUTOMATICALLY onto the Invoice.

Likewise a Stock Controller, operating a manual system, could transpose the quantity sold, when posting from a copy invoice, and deduct 93 pcs from the Stock card, instead of 39. This would understate the book stock by 54 pcs, and possibly cause the product to be re-ordered, and consequently overstocked. Again, this could not happen with an integrated system, since the quantity invoiced is AUTOMATICALLY deducted from stock, due to integration of the Invoicing and Stock Control programs.

WHY THE BBC MICRO?

Because, although originally designed as an educational computer, it has the facilities needed for serious business use. In particular, speed of operation ... although only an 8 bit machine, it has a faster operating speed than many 16 bit micros. By gearing a suite of Integrated Accounting programs to the BBC Micro, Gemini have produced a combination of excellence which will eclipse any other computerised business system in its price bracket ... and many other systems in much higher price ranges.

WHY GEMINI?

Because our business software for the BBC Micro is based upon the solid foundation of experience.

We have successfully written business software for the BBC Micro since it was first launched.

Your choice of software for a computerised business system is critical ... badly written programs could bring your business nearer to ruin, more quickly than almost any other investment. The fine reputation of Gemini, evidenced by the Independent press comments listed below, are your guarantee of confidence in the professional experience which back this major investment in the efficiency of your business.

INTRODUCTION

Designed for the small to medium sized business user, where speed and efficiency are vital, Gemini Integrated programs are suitable for sole traders, partnerships, or limited companies. All require a BBC B 32K microcomputer, and an 80 column printer. A double disk drive with an Acorn compatible DFS is required for integrated accounting purposes. A single disk drive may be sufficient where modules are used independently, although this is not recommended for the Sales Ledger and Invoicing module. The manuals indicate the system capacities for various disk drive combinations.

The programs have been devised by H.C.C.S Ltd in the light of substantial mainframe computing experience, and share many of the features normally found only in very large installations. Used in a typical business environment where invoicing, sales ledger posting, stock control adjustment and nominal ledger posting is simultaneously made, the software will convert the BBC micro into a business computer of enormous power, directly comparable with hardware/software combinations costing many times its price.

Each program is supported by a comprehensive, easily followed manual, and 'user friendly' screen prompts with error trapping routines, which make a specialised knowledge of accountancy unnecessary for the average user. All the programs, however, have many sophisticated features which make the programs revolutionary for the home micro market.

Gemini Marketing Limited confidently recommend the programs to serious commercial owners of the BBC B micro as software capable of making an enormous contribution to business efficiency and profitability at minimal cost, since it requires no expensive second processor in order to achieve the advantages of integrated accounting.

NEW LOW PRICE

Price £69.95 per Module

Includes 1 year software support



INDEPENDENT PRESS COMMENTS

John Vogler reporting in December 1984 edition of 'A & B Computing' said of Gemini Integrated Accounting when comparing to Peartree, Micro Aid, Software for All, Acornsoft Mirle and Sage:–

"This is the newest and most exciting. To have achieved a substantial degree of integration, very rapid file access and respectably large file sizes, without the use of a second processor, is a fine achievement. As one would expect from GEMINI, the individual modules are eminently professional and for the first time present the single processor BBC as a viable small business computer ... GEMINI have produced a superb product ... superb examples of the programmer's art."

INVOICING & SALES LEDGER

The Gemini Sales Ledger and Invoicing program will produce invoices and statements for customers and enable a tight control over credit procedures to be maintained by producing aged debtors reports, and by keeping current information concerning customer accounts.

The module can be used independently or interfaced with the Gemini Nominal Ledger and Stock Control modules, and offers the following advantages: • Maintains open-item sales ledger. • Comprehensive customer Master File maintained in memory. • Choice of fixed and free format invoices. • Integrates with Gemini Nominal Ledger and Stock Control modules. • Prints invoices, invoice copies, statements and credit notes. • Reports include: Aged Debtors, Sales Daybook Sales analysis by user defined code, VAT analysis, Audit trail giving copy details of all transactions. • Automatic updating of sales ledger. • Comprehensive accounting controls including period end close down routines and full audit trail for all transactions. • Examine customer status by file enquiry to screen or printer showing year to date activity. • Trade and settlement discount terms definable for each customer. • Caters for up to 5 rates of VAT. • Can hold up to 135 customers on 40 track disk system and up to 610 customers on a 80 track disc per Sales Ledger file. • Comprehensive analysis of invoices over unlimited, user definable sales codes. **Price £69.95.**

PURCHASE LEDGER

Used independently or interfaced with the Gemini Nominal Ledger, the program maintains a complete file for each supplier, records amounts outstanding at any time, helps to determine which invoices are payable, and payment dates for the claiming of discounts. Among this module's many features are the following: • Automatic posting of suppliers' invoices to Purchase Ledger. • Comprehensive analysis of invoices over unlimited, user definable expense headings. • Comprehensive accounting controls including period end close down routines with posting reports, and full audit trail facilities at appropriate stages of processing. • Full integration with Gemini Nominal Ledger module. • Purchase invoices and credit notes easily processed. • Supplier file held in memory, with full details of each supplier. • Maintains open item purchase Ledger. • Management of invoices due for payment within cash restraints. • Maximum number of suppliers on 40 track disk system of 135 and maximum of 610 suppliers on 80 track disk system per Purchase Ledger file. **Price £69.96**

NOMINAL LEDGER

This is the central module of the Integrated Accounting system and may also be used independently as a Cash Book or interfaced with the Sales and Purchase Ledgers and payroll programs. It includes the following main features: • 143 Nominal accounts all of which are user-definable. • Posting of transactions from Sales and Purchase Ledgers and Payroll modules. • Full Cash Book facilities. • Print out of full Trading and Profit and Loss Account and Balance Sheet together with notes to the accounts. • Full accounts may be produced for whatever period chosen by the user. • Comprehensive accounting controls including period end close down routines and complete audit trail for all transactions. • Journal feature for adjustments between accounts and correction of book-keeping errors. • Reports include: Account Master File showing complete code listing. Cash Book entry details. Journal printouts. Trial Balance. Trading and Profit and Loss Account with notes. Balance Sheet with notes. Audit Trail Enquiry for all accounts. • Account enquiry showing movements over the period under review including opening balance, period end adjustments and closing balance. • Account posting masks allow conversion of analysis codes set up in other modules into selected user-defined Nominal Ledger codes. **Price £69.95**

PAYROLL

This program provides a full range of controls over the different aspects of Payroll Accounting icluding tax and other deductions. It can be used independently, or interfaced with the Gemini Nominal Ledger, and offers the following facilities: • Employee file maintained in memory, containig: Name, address, sex, marital status, National Insurance Number and contribution type, date of birth, personnel number, department, date employment commenced, all applicable tax codes, whether week 1 or month 1 applicable, hourly or salaried, pay cycle, payment type (cash, cheque or direct transfer), PAYE reference number, previous name, bank details. • Supports weekly, fortnightly, four weekly or monthly employees. • Company master file containing: Name, address, bank account number and name, bank name and branch, PAYE reference. • Produces cash analysis of note and coinage to suit requirements. • Employee pay details include: Gross pay and tax paid to date both current and previous employer. National Insurance contribution for employer and employee. Five rates of overtime per employee. Up to 12 standard and 5 non-standard pay elements per employee. Basic pay. Hourly rate. • Reports include: Payroll reconciliation, Payslips, Coinage analysis, Cheque and bank giro list, Payroll masterfile, Departmental analysis. • Relevant data to complete Inland Revenue forms including: P11, P35, P45, P14/P60. • Maximum 98 employees on 40 track disk system and 198 employees on 80 track system per Payroll file. **Price £69.95**

STOCK CONTROL

A program providing full control over every aspect of stockholding operations which can be interfaced with the Gemini Sales Ledger and Invoicing program, this module includes the following features and routines: • Inventory Master File holding details of part number, selling and cost price, sales and product code, current stock, location of stock, allocated items, re-order level, quantity on order, current period activity and supplier code. • Permits four types of transactions – sales, returns, receipts and adjustments. • Part enquiry routines for any stock item. • Reports include: Part catalogue, giving stock sales and cost values. Re-order report. Evaluation stocks list, giving stock sales and cost values. Dormant parts report. Delete parts report. Stock usage report. Stocktaking sheet. Stock audit report sorted into part sequence and transaction type and date. • Screen prompt when item falls below the minimum re-order level. • Directly interfaces with Sales Ledger to enable automatic generation of product details for invoice production and adjustment of stock records. • Maximum 980 part numbers on 40 track disk and 1980 on 80 track disk per stock file. **Price £69.96**

Gemini Midi Maxi Offices, sole distributors to the trade –

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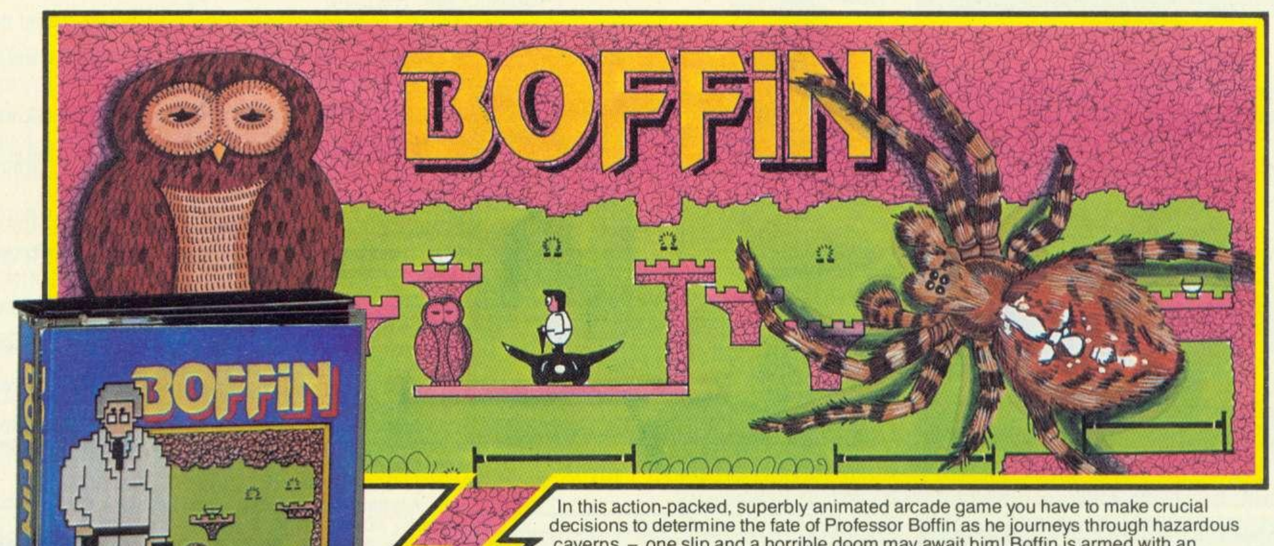
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AU

Can YOU avoid the fangs of a deadly spider?

▸ Addictive launch BOFFIN ◂
A Mad Professor on the Loose



In this action-packed, superbly animated arcade game you have to make crucial decisions to determine the fate of Professor Boffin as he journeys through hazardous caverns – one slip and a horrible doom may await him! Boffin is armed with an umbrella which he can put up to break a fall or a leap from a great height, and trampolines are to be found in certain of the caverns which help him to "bounce" his way to safety. However, there is added danger as hideous creatures are lurking waiting for Boffin to stray too close to their fateful grasp!

Boffin is available for BBC 'B' and Electron priced £9.95.

ALSO AVAILABLE



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Stringer is an arcade adventure game in which you are a press photographer set the task of snatching a shot of a Film Star in an hotel. The game is tantalisingly playable, graphically excellent and, of course – Addictive!
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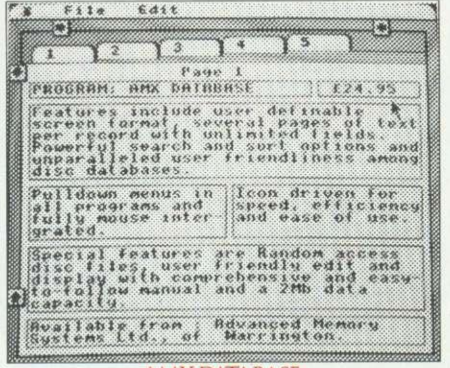
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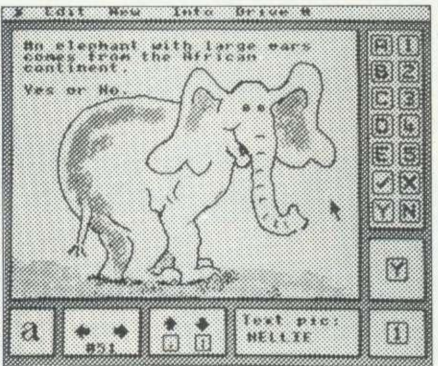


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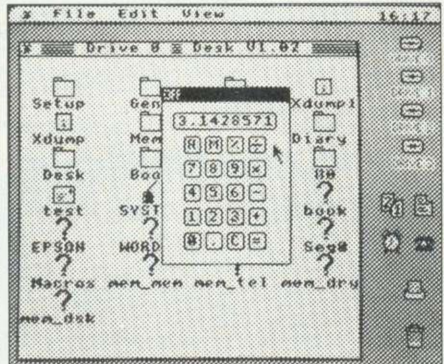
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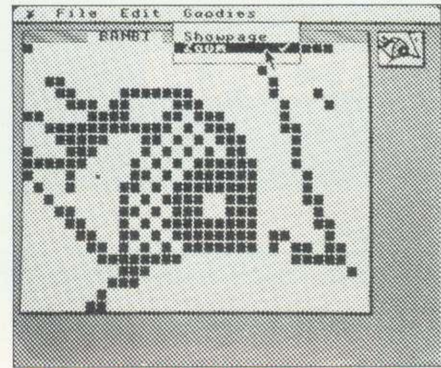
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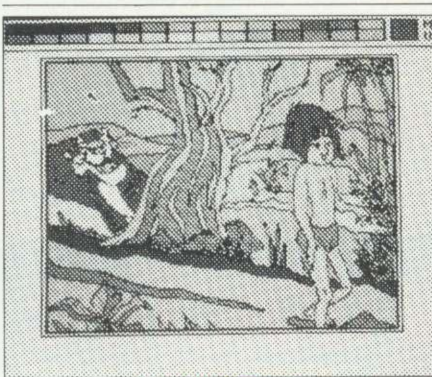
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From Advanced Memory Systems comes an irresistable selection of Icon driven software that AMX Mouse, ROM and AMX Super ROM owners can really get their teeth into!

Seven incredible programs, so comprehensive, they will more than satisfy even the most demanding BBC Micro user and when coupled with the AMX Mouse will broaden the horizons of the BBC Micro to new, undreamed of standards of sophistication.

AMX PAGEMAKER.

A fantastic high resolution A4 Typesetting and Artwork system.

Comprising 2 ROMS (8K and 16K) 'Pagemaker' features a fast scrolling A4 page.

There is a wide selection of typefaces and user definable fonts.

You can load in Wordwise and View files or type directly onto screen.

An incredible 'Cut and Paste' facility includes copying, rotating, stretching and zooming.

For the professional touch there is N L Q high quality dump, and you can dump any part of, or full A4 page.

AMX 3D ZICON.

Now, with a 3D ZICON you can transform three dimensional vector data and translate them into on-screen graphics.

You can Print or Plot graphics to suitable peripherals and produce output suitable for other AMX programs such as ART – UTILITIES and Paintpot.

There is even the facility to sketch in two dimensions and convert to three dimensions and auto swaps generator.

Some interesting example objects on file include – helicopter – jet plane and dodecahedrom.

AMX DATABASE.

Database is a brand new super filing program featuring 1000 records and unlimited fields per record.

It has a powerful search and sort facility and user friendly edit and display.

In fact it is probably the most advanced user friendly database available today.

Special features include: User definable screen format for record display – random access files – super fast sort – flexible printer dump and screen display.

AMX XAM.

A brand new and exciting educational program with maximum flexibility, allowing a multitude of options and variations.

With XAM you can create a multiple choice exam which would not be alterable by the examinee.

And you can incorporate within the questions, your own pictures, created on AMX ART, building the finished picture into the quiz and providing an extra and fascinating aspect to the examination.

AMX DESK.

The complete home or office acquisition.

You will wonder how you ever managed without AMX Desk.

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MEMO-PAD for up to three pages of text

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DIARY with three months calender

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CALCULATOR – Yes! A full function calculator that cannot be lost or suffer flat batteries, and any window can be dumped to your printer at the touch of a button.

THE ORIGINAL AMX ART PLUS UTILITIES.

Now available as a single package – two of AMX's most popular programs.

AMX ART is a superb mode 4 graphics program, making full use of windows, icons, menus and pointers, it allows you to create your own pictures and the host of graphic features in AMX UTILITIES including a fantastic zoom facility for accurate amendments to your ART pictures – one dot becomes a character.

You can also move, copy, rotate, reflect, enhance circles, draw ellipses and arcs, even print icons.

Border can be added and pictures stripped and centred for saving and printing. All pictures can be loaded into AMX PAGEMAKER, AMX 3D ZICON, AMX XAM, AMX PAINT POT, and AMX SUPER ART.

AMX PAINT POT.

The pictures you have created with AMX ART and enhanced with AMX Utilities can now be coloured in, using PAINT POT.

They will burst into life with rich, vibrant colours, and with a palette of 256 different shades you should not be short of inspiration.

You can even store up to 20 Illustrations in Picture Show mode, then display them in sequence.

To start you off we have included eight exciting pictures in the program.

AMX SOFTWARE

IMAGINATION AT YOUR FINGERTIPS.

ALL THESE EXCITING AMX ROM AND AMX SUPER ROM COMPATIBLE SOFTWARE PACKAGES ARE AVAILABLE FROM GOOD COMPUTER DEALERS OR BY SENDING CHEQUE TO PO TO FREEPOST ADVANCED MEMORY SYSTEMS LTD, GREEN LANE, APPLETON, WARRINGTON WA4 5NG.
FOR INSTANT ACCESS OR VISA ORDERS TELEPHONE (0925) 602959/602690.

We thought it was about time we put you in the picture.



When we introduced our AMX Mouse to BBC Micro users, the response was phenomenal.

And no wonder!

It was regarded as 'pushing the BBC to its limits' and hailed by the press as 'probably the best input device that has appeared recently'. The AMX Mouse brought to BBC Micro users the same sophisticated, positive control that had, until then, been the province of the more expensive computers, like the Macintosh.

Now we announce a new enhanced software package which, can be used with a traditional keyboard or joystick but truly comes into its own when used with the AMX Mouse.

AMX Super ROM and Super Art adds colour to the features of the original AMX ROM, on a new 16K ROM.

It dramatically extends the original AMX ROM facilities to include Pull Down Menus, over lapping colour windows, colour patterns and an extended Icon set in all graphic modes.

Specially written to be usable with the vast majority of BBC Systems including 2nd processors, the Aries RAM Board, the BBC + Shadow mode, tape, DFS and ADFS.

The kernel of the Super Art program is included in the 16K ROM, providing tape and disc users with a Mode 1 colour drawing program.

But Super Art really comes into its own when used on a disc based system; a host of additional facilities can be selected direct from the screen.

Colour pictures can be created in dot resolution up to A4 size by scrolling the screen window, over the picture.

Other facilities include colour pattern editing – use of icons, additional text styles, various copy facilities and a superb colour Zoom.



Pictures can be printed out in colour (Integrex) or shades of black and grey on Epson compatible printers.

The results can be astonishing! – you can even store your finished 'masterpieces'.

The AMX Icon Designer facility gives you further freedom to design and store your own custom icons for use in your own programs.

This fabulous new package costs only £89.95 – a price as remarkable as the package itself – and includes a fully illustrated operating manual.

If, however, you are afraid of mice, you can purchase just the software package plus the 16K Super ROM for just £49.95.

You will still achieve some pretty remarkable results using your keyboard or joystick – not nearly as good as with the Mouse of course – but you can always add one later on for just £40.

Then you'll really be 'in the picture'.



IMAGINATION AT YOUR FINGERTIPS.

BOTH THESE EXCITING PACKAGES ALONG WITH OUR SUPERB RANGE OF AMX ROM AND SUPER ROM COMPATIBLE SOFTWARE ARE AVAILABLE FROM ALL GOOD COMPUTER DEALERS OR BY SENDING CHEQUE OR P.O. TO FREEPOST ADVANCED MEMORY SYSTEMS LTD., GREEN LANE, APPLETON, WARRINGTON, WA4 5NG.
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COMPUTERS

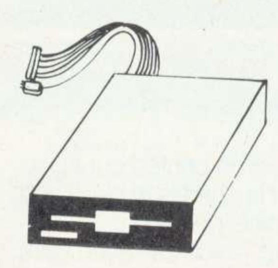
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BBC Mod. B, View or Wordwise, High Res. Monitor, Queen Data daisywheel printer, Cassette recorder with 10 cassettes and all the necessary cables and printer paper. **£665.00**

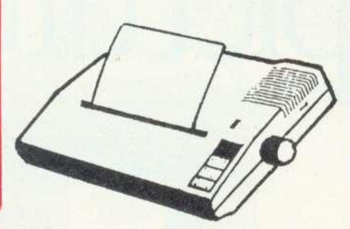
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BBC Mod. B + DFS, View or Wordwise, 100K BBC drive, High Res Monitor, Quendata daisywheel printer, 10 diskettes and all the necessary cables and paper **£780.00**

BBC3
Same as BBC2 but with 400K drive **£805.00**

BBC4
BBC Mod. B + DFS, View or Wordwise, 800K Dual Disc Drive, High Res. Monitor, Juki 6100 daisywheel printer, 10 of 80 track Diskettes and all the necessary cables and printer paper. **£879.00**

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EPSON LX80 + NLQ for WORD PROCESSING



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The New Centronics GLP Printer with NLQ, 50 CPS.

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We would like to take this opportunity to wish all our customers a "MERRY CHRISTMAS and a HAPPY NEW YEAR"

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MONOCHROME MONITORS

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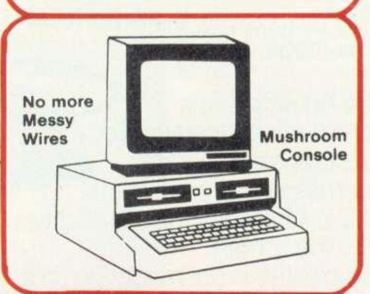
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Nordmende 12" Hi-Res Green Monitor only **£59.95** (While stocks last)

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Once again TCL has answered a special need of all BBC Computer users with the new mushroom workstation - no more untidy wiring or pulled plugs. Transforms your system into a handsome console unit.

Features include:

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MUSHROOM WORKSTATION
At a Special Price of **£349.00** inc. VAT

Those people already owning disc drives can have them fitted into the Workstation. Prices on request.

EXPANSION BOARDS

RAMAMP RA20+44
The RA20+44 board has 20K of RAM addressed from &3000 to &7FFF when switched on with *VIDEO. This will in effect give you back 20K of RAM if you are using say MODE O. There is also 2 slots of sideways RAM from &8000 to &BFFF which can be used for ROM based software. There is a further 12K of RAM from &8000 to &AFFF which can not be used as sideways RAM. This is the situation in the BBC+ and it means in effect that this board will turn your BBC into a BBC+ as far as the VIDEO and the extra 12K RAM is concerned. One can read and write to this 12K RAM in the same way as the BBC+ does. We offer this RAM as a printer buffer.

RA20+44	£79.00
Write protect kit	£5.00

RAMAMP RA32N
The RAM/ROM board has 6 slots of ROM and 2*16K of sideways RAM that is addressed from &8000 to &BFFF. THIS EXTRA RAM IS NOT AN EXTENSION OF MEMORY FOR BASIC.

RA32N	£59.00
WPK/N	£5.00

RAMAMP RAM16
The 16K RAM BOARD (RAM16) is a sideways RAM board which plugs into any spare ROM slot. It is addressed from &8000 to &BFFF. THIS EXTRA RAM IS NOT AN EXTENSION OF MEMORY FOR BASIC. A write protect switch can be fitted. Any utility can be *LOADed into the RAM directly from Disc with the command *LOAD "FILENAM" 8000 RETURN. This can be done wherever the board is fitted, the slot need not be specified.

RAM16	£32.00
WPK/RAM16	£2.50

RAMAMP ROM6S
The ROM board has 6 slots of ROM (ROM6). Each slot can accommodate any 8K or 16K ROM. One can NOT fit RAM at a later date.
The board is fully buffered.
The board is compatible with all D.D.D. Controllers, RAVEN 20 and indeed our own RA20+44. It is compatible with the SOLIDISC 16/32K or 64K sideways ram board.

ROM6S	£32.00

RAMAMP RA32+
The RAM/ROM board has 4 slots of ROM and 2*16K of sideways RAM that is addressed from &8000 to &BFFF. THIS EXTRA RAM IS NOT AN EXTENSION OF MEMORY FOR BASIC.

RA32+	£58.00
WPS+	£5.00

The RAMAMP boards come complete with RAM inclusive in the price and are fully buffered. Fitting takes only a few minutes. No soldering required. No bits of the I/O port are used. All bits of the I/O port are yours. Free software is available. Write protect switch can be fitted if required.

RAVEN 20
The RAVEN 20 is a 20K RAM Expansion board for the BBC Micro Model B fitted with O.S. 1.2.
The RAVEN Board provides the user with an extra 20K of usable RAM in screen modes 0-3. This together with the aid of software makes the system completely transparent to both the user and the computer. **£49.00**

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FIRMWARE	
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AMX 3D Zicon	£24.95
AMX Database	£24.95
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Communications ROM includes Full Prestel Facility and control of WS 200 Autodial Auto Answer 30 ARDS.

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DISK DRIVES

Cumana, Europe's leading supplier of floppy disk drives and the only manufacturer to date to win BEAB approval to BS415 for electrical safety, now have an even wider product range than ever before – whether for the BBC, Spectrum, QL, Amstrad, Apple, Enterprise, Dragon, Tandy, Electron, Oric Atmos, Cumana have the best quality drives available.

UPGRADE

But Cumana's range now covers much more than just disk drives; there's a growing range of exciting new computer products designed to uprate and extend the uses of the most popular micros. Products like the Cumana Upgrade – a major expansion to the BBC and QL micros, enabling real-time minicomputer performance with .5Mb of RAM and high level applications software. 10Mb and 20Mb Winchester systems are available for both the QL and BBC using Upgrade.

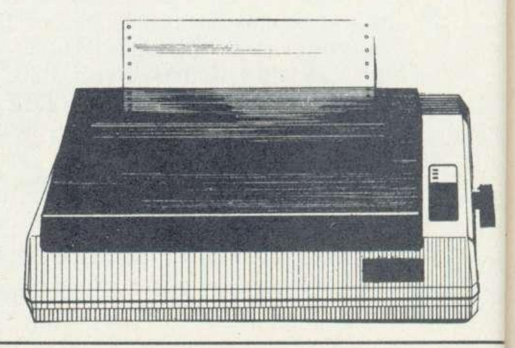
TOUCH PAD

There's the new, improved Touch Pad graphic input device with powerful Screen Artist software – an infinite variety of graphic design or artistic uses for the home, business or education, taking you another step towards the professional league. Ask us about the new Touch Pad library!

SOFTWARE

Also new and exclusive to Cumana is Pocket Wordstar – a full implementation of Wordstar & Mailmerge, the industry standard word processing package. Thanks to Cumana, it's now available to you, at a price within every users pocket.

Cumana the very best name in memory.



...ME — AN ALL IN ONE

Wordprocessing system for the BBC to make the AMSTRAD PCW8256 look greener than just green . . .

PCW8256, but if you still need more, turn over the page and look at the new Solidisk baby: up to 500K of ROMs and a cool 4 Megabytes of RAMs, enough to knock down any challenger.



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INTEGRATED SOFTWARE?

That will do nicely

Solidisk introduces the SWR256

SPECIAL FEATURES:

The SWR256 system has a Programmable Memory Management Unit on board, totally compatible with all well known software.

It consists of a ROM register (&FE30), a Shadow register (&FE34), an Access register (&FE32), and a Size register (&FE36).

The ROM register duplicates the one built into the BBC board. It selects one of the 16 possible ROMs.

The Shadow register is new and similar to the BBC PLUS implementation. It selects one of the 128 possible Shadows or moves a Sideways RAM into the Shadow area.

The Size register is new and not implemented anywhere else. It specifies how big you want your Shadows and your ROMs.

The normal setting is 16K for Sideways ROM/RAM and 20K for Shadows.

If bit 0 is set, your Sideways ROM or RAM is 31K (useful for Hi-language, from &8000 to &FC00).

If bit 1 is set, your Shadow is 30k (useful for language, from &800 to &8000).

Bits 2 and 3 are reserved for possible Shadow modes 3 and 7.

The built-in software in the Solidisk Super Toolkit (a 32K ROM) runs with all well known ROMs and will handle all MOS calls.

By programming the Size register, it is possible for a ROM to have 61K of continuous memory, more than you can get with the 6502 Second Processor and you will still retain the paging facility.

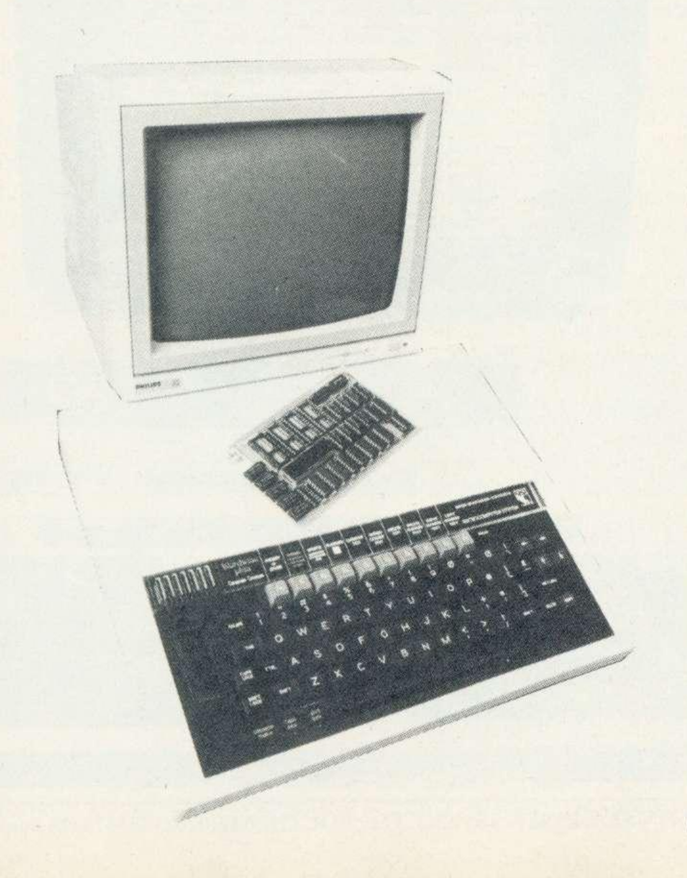
By programming the Shadow register, one ROM can move another ROM into the Shadow area and call routines directly there.

There is also a 16 pin expansion socket on the board for direct access to the RAM array.

In a word, the Solidisk SWR256 is the perfect partner for any serious integrated software.

The new SWR256 is available by direct telephone or mail order from Solidisk and selected BBC Specialists.

SOLIDISK Office System



To: Solidisk Technology Ltd 17 Sweyne Avenue Southend Essex SS2
Please rush me the following:

.... SWR256K Ram at £175 incl. VAT and carr.

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My Access ☐ Barclaycard ☐ no. is ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

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SOLIDISK MITSUBISHI DISC OFFER

A Complete Disc System containing everything you need, including 1 Blank Diskette, at a new low price of only £200.00 inclusive.
The Misubishi Offer Comprises:
— One Mitsubishi MF4853, Double Sided, 80 Track Disc Drive. Cased in beige with all leads.
— One Solidisk DDFS complete Disc Upgrade with 2.0 ROM.
— One Verbatim MD525 Blank Diskette.
— One Software Pack and User Manuals.
— Full one year guarantee.

HARDWARE:

As described earlier as shown opposite.

THE SOFTWARE:

The software comprises 5 diskettes, formatted in 80 tracks.

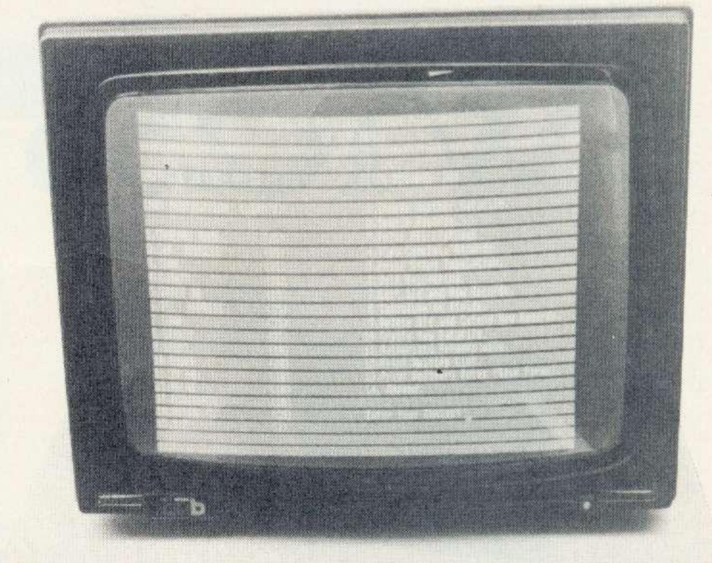
Volume 1:
Solidisk Word Processor and Spelling checker with English dictionary. Easier than View, Wordwise or Scribe, you enter the WP by *WP filename, then start typing. What you see on the screen will be exactly printed on paper.
Most useful commands are all displayed on the top part of the screen.
It features 80 column screen throughout with direct on screen justification, automatic margins, page numbering, Wordstar like editing commands for block move, block delete, block copy, print, save, load text to cursor, insert and overwrite, search and replace, total word count, word frequency count, free space, *commands etc. Solidisk WP loads and saves texts in under 1 second flat and also you may save the edited version as many times and under any filename you like.
It has the unusual ability to spellcheck your document without leaving it, simply by typing in Control-U.
It has self dictionary generating capability too. You may create any dictionary you like by just simply entering the words.

Volume 2:
Volume 2 contains Solidisk Database. It is a random access system, completely menu driven and easily customised to suit any particular filing need.
It features unlimited filesize and number of records, supports all maths functions and 80 column screen throughout.
It is simple to understand and to use. You take one of the 15 different options to start. Each option will then lead to a new menu and so on. Mostly you only have to enter an appropriate data or hit the RETURN key.
You can design new databases, list all records, edit them, merge them, split them, making mailshot with Solidisk WP etc. . . We use it to process all your orders.

Volume 3:
Volume 3 contains Solidisk Spreadsheet. Menu driven with standard options to create, edit, recalculate, print, search, sort, report generator and mailmerge.
Unlimited number of rows and columns. Each column can be as small as 2 or as big as 70 characters. All math functions are supported. Complete with home banking and simple portfolio management.

Volume 4:
Volume 4 contains the Solidisk tape to disc program and a selection of computer games.

Volume 5:
Volume 5 contains MBASIC, SIGEN and other disc utilities.



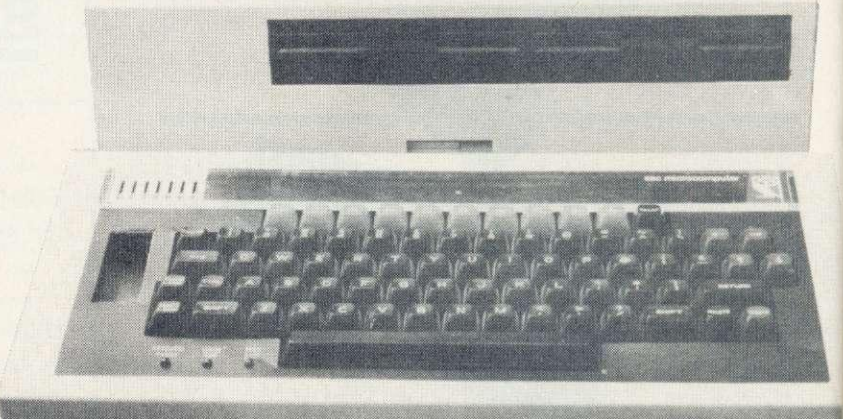
IMPORTANT:

If you upgrade to a twin Mitsubishi disc system, Solidisk will offer you, subject to stock availability, a completely free set of CPU and keyboard case as shown earlier.

You should return your disc drive with payment for another Mitsubishi MF4853 (£160.00) or alternatively, save by ordering right now a Fantastic Offer at only £340.00.

The keyboard is 12 mm lower than the normal BBC case, 2-3 degrees more angled, weighs only 5lbs, does not skid about on the desk while enjoying 2 feet of freedom from the computer unit — and makes a lot of difference to typists (even 2 fingered ones!)

The CPU accommodates 2 disk drives and withstands any heavy weight monitor while providing easy attachment for the whole system, CPU and disk drives, to the desk if need be. Good ventilation to the power supply too and hides all untiday cables away.



PRICE

The complete CPU and keyboard case costs £30.00 inclusive + £3.00 post and packing. The system could be yours free as part of the Mitsubishi twin discs offer.

SOLIDISK TECHNOLOGY LIMITED, 17 SWEYNE AVE, SOUTHEND-ON-SEA, ESSEX SS2 6JQ. TEL. SOUTHEND (0702) 354674 (16 lines).

ADVANCED FILING

SOLIDISK 1770 DISC INTERFACE For the BBC Computer

The Solidisk Double Density 1770 Disc Interface enables the standard BBC B computer to use most current types of disk drive. Only 4 components need to be fitted into existing sockets on the computer and this can be done in a few minutes by novice and expert alike. It now can run all Acornsoft games (such as Elite, Aviator, Revs, Magic Mushroom etc. . . .) and most other protected discs (Castles Quest, Island's Music System etc. . . .)

The Disk filing System provides every facility that you would expect such as built-in disc formatter and verifier, automatic 40/80 track switching, programmable disc speed and is upgradable to the Solidisk ADFS.

It also has some significant advantages over the Acorn 1770 system, mainly:

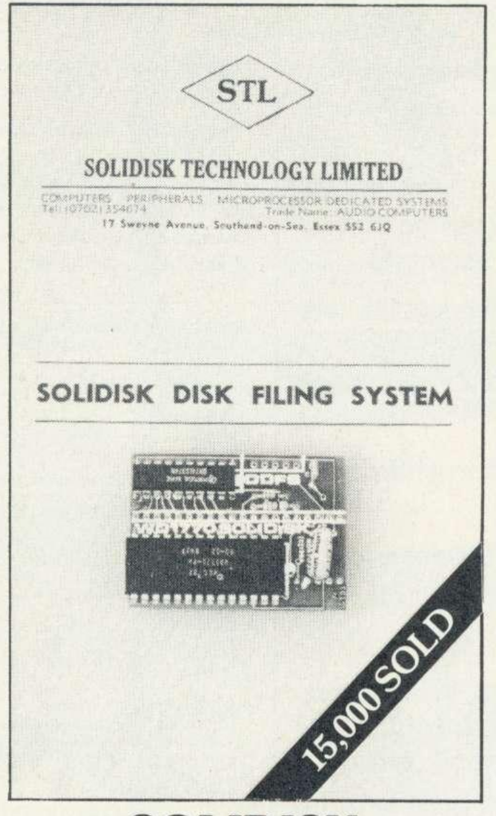
1) 60% more storage capacity in double density DFS, giving you up to 640k on a double sided 80 track diskette as opposed to only 400k bytes with the Acorn 1770.

2) Better emulation of the 8271: some protected discs (such as the early Acornsoft's Elite game) would not run on the Acorn 1770.

3) Built-in useful disk utilities such as TAPEDISC, MZAP, DZAP (disc sector editor), RECOVER, RESTORE etc. . . . which would add to cost if bought separately.

PRICE:

The 1770 Double Density Disc Interface costs £45.00 inclusive of VAT, DFS 2.0 ROM, manual and 1 year guarantee.
If you wish, you can also order it with the ADFS ROM and the total cost is £55.00 inclusive.



SOLIDISK ADVANCED DISC FILING SYSTEM for the BBC Computer

The Advanced Disc filing System (ADFS) is now officially endorsed by Acorn and is certainly going to revolutionise software for the BBC Micro.
The Solidisk ADFS, reviewed in A&B Computing 85, whilst comparable to Acorn's ADFS, is very much designed with floppy disk and DFS software compatibility in mind.
The Solidisk ADFS will run most software available for the BBC computer, including all Acorn languages and the View family, Computer Concepts Wordwise and the INTER family, Gemini's Datagem etc. . . .
It also has PAGE at the lowest value, eg &1900 with one channel. It can realistically support up to 10 opened channels without slowing down the program as it does not swap buffer pages to disc.
It also has utilities such as *FORM, *VERIFY, *BACKUP etc not found in the Acorn ADFS ROM.
It is also very responsive and double safe, with automatic head settling and read after write automatic error correction.
It runs with all Acorn second processors including the latest 32016 mainframe machine (only Z80 CP/M requires new MFM BIOS) and it is fully supported by the Solidisk Toolkit ROM.
The Solidisk ADFS is available for the BBC B or PLUS fitted with the Solidisk 1770 Disc Interface or the Acorn 1770 as a TWO ROM chip set, consisting of the DFS 2.1 and the ADFS 2.1. A 32k ROM may be supplied in lieu of the 2 ROMs on request. It costs £20.00 when purchased separately like this.

SOLIDISK 1770 + 8271 Disc Interface For the BBC Computer

As Acorn are now backing the Advanced Disc Filing System, many of you, having got the 8271 Disc Interface, wonder what you are going to do next.

If you get the Acorn 1770 upgrade, you will have to part with your 8271 and possibly a few expensive pieces of software such as the old Elite or Replica II which won't run without the 8271. It is still only a single density DFS.

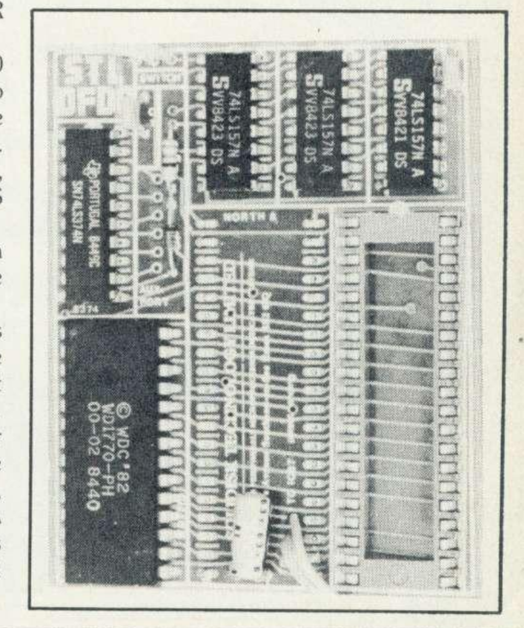
The alternative is to get the Solidisk 1770 + 8271 Disc Interface (known as the DFDC, acronym for Dual Floppy Disc Controller) which will let you keep the 8271 which you already have and add 1770 Double Density capability.

It is low cost, tiday and easy to fit.

At a flick of a switch, you can select either the 8271 or the 1770 Floppy Disc Controller.

You will have the best of both worlds: compatibility with the 8271 and fascination with the 1770 ADFS.

It is probably the fastest, more powerful and versatile Disc System for the BBC.
The DFDC costs £60.00 including VAT, manual, DFS 2.0 ROM and ADFS 2.1 ROM.



SOLIDISK TECHNOLOGY LIMITED, 17 SWEYNE AVE, SOUTHEND-ON-SEA, ESSEX SS2 6JQ. TEL. SOUTHEND (0702) 354674 (16 lines).

ACORN COMPUTER SYSTEMS

BBC Model B + DFS...£360 (a)
BBC Model B + Econet..£335 (a)
BBC Model B + Econet + DFS...£399 (a)
BBC B PLUS...£409 (a)
BBC B PLUS with 128K Kit...£434 (a)
BBC Dust Cover...£4.50 (d)

UPGRADE KITS

Acorn DFS Kit.............£80 (d) 1.2 OS ROM.............£7.50 (d)
Econet Kit...................£55 (d) DNFS ROM.............£17.50 (d)
BASIC II ROM with User Guide..................................£22.50 (d)
1770 Upgrade Kit for BBC B to B plus.........................£42.60 (d)
ADFS is Acorn's long awaited double density disc interface system. The hierarchical filing system on the ADFS allows almost unlimited number of files. Treating a double sided disc drive as one drive allows storage of much larger files and greatly enhances the storage efficiency. Will read 40T discs on 80T drives.
ADFS ROM (for upgraded B's and all B plus)...............£25.20 (d)

ECONET ACCESSORIES

Econet Starter Kit.........£85 (b) Printer Server Rom.......£41 (d)
File Server Level I.........£75 (d) 10 Station Lead set........£26 (c)
File Server Level II......£210 (d) Adv. Econet User Guide.£10 (d)

ACORN BITSTICK

The renowned 'BITSTICK' graphic CAD package. Using the on-screen menu and colour pallette, it can draw freehand as well as lines and shapes with great accuracy. Any part of a drawing may be magnified many times, and up to 48 drawings may be saved on a disc. In total, a friendly yet sophisticated CAD system offering tremendous value.
BITSTICK I £310 (a)
ROBOCOM BITSTICK II: This bitstick comes with Bitstick I software upgraded to allow for auto dimensioning, scaling £795 (a)
ACORN's multiplotter driver for Bitstick graphics £79 (c)
(All popular plotters included)
Epson FX80 screen dump routine for Bit Stick £35 (d)

ACORN WINCHESTER DRIVES

Acorn Hard Discs are now available in 10 and 30 Mbyte versions. The drive plugs into the 1 MHz bus. The ADFS filing system with its hierarchical filing structure provides excellent file management facilities. Data transfer rate of 1Mbit/sec and average seek time of 85 ms provides the user very fast access to very large amounts of data. File Server Level III can be installed on the Hard Disc before delivery.
10 Mbyte Winchester Drive £1299 (a)
30 Mbyte Winchester Drive £1999 (a)
Add £200 to the cost if File Server Level III is to be installed.

ACORN 2nd PROCESSORS

The Z80 2nd Processor converts your BBC into a CP/M business computer. Complete with comprehensive free software. £340 (a)
The 6502 2nd Processor provides both an increase in speed and memory. £175 (a)

ACORN P-SYSTEM

Intended for use with the 6502 Second processor, this portable operating system is a complete implementation and comes complete with a Filer, Editor, and compilers for two languages, USCD PASCAL and FORTRAN-77. Widely used in universities and colleges, as well as being popular with business software authors, P-System is user-friendly, offering ease of program development as well as portability. **P-System** £263 (b)

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Please note that a 'Prestel' type terminal must be used.

EPROMs/RAMS

2764-25.......£2.20 27128-25.....£3.00 (d)
6264LP-15.........£4.00 (d)

TORCH PRODUCTS



GRADUATE: The ultimate upgrade — converts your BBC into a powerful 16 Bit business computer and makes it disc and hardware compatible with the IBM PC. With 256K RAM and dual drives, it simply connects through the 1 MHz bus. (The disc drives can be used in both BBC and IBM mode, without requiring a disc interface.) The top-of-the-range Model G800/2 comes complete with the free Xchange range of software, and includes a full feature word processor, a spreadsheet, a database and a business graphics all linkable.

Graduate G800/2...................£699 (a)
(Offer valid for limited period only).

Z80 Card ZEP100 with PERFECT Software
Packages + Z80 Basic....................£275 (a)
Z80 Disc Pack ZDP240 with software as above...............£550 (a)
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Unicorn 68000, Unix OS/Z80B/512K, 20MB
Hard Disc, 400K Floppy..£3495 (a)

MULTI-FORM Z80 2nd PROCESSOR

This is a unique Z80 2nd processor running CP/M and allowing use of the massive range of CP/M software. What makes this unit rather special, is that it can be used with software from other CP/M computers, without the user needing specially configured software for the BBC. As supplied, the unit will read many formats and it is possible to configure the unit for virtually any other CP/M machine. Please contact us for further information.
Multi-form Z80 2nd Processor £299 (a)

META-ASSEMBLER

Both an editor and Macro-Assembler. Meta can assemble most 65xx, 68xx, 6804, 6805/6305, 6809, 8048, 8080/8085, Z80, 1802 and more. (Free updates due very soon — 68000 series, 8088/8086, Z8000 etc.) Many advanced features including Macros, conditional assembly, Global/selective search etc etc. Includes 16K Eprom, disc, function key card, and comprehensive manual. Please phone for comprehensive leaflet.. **Meta-Assembler** £126 (c)

MUSIC 500/SYMPHONY

Acorn's MUSIC 500 is a sophisticated music composition aid and sound effects generator. Phone for leaflet. **Music 500**
SYMPHONY KEYBOARD from ATPL is a professional 4 Octave keyboard with sophisticated software.
Symphony Keyboard £108 (a)
Synth-500 disc allows its use with Music-500 **Synth-500 Disc** £10(d)

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PRINTERS

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EPSON DOT MATRIX PRINTERS: EPSON — the high quality range of dot-matrix printers that set the standard in the industry. A wide range of interfaces ensure that these top-of-the-range printers can be used with most computers.

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FX80 + **£315 (a)** FX100 + **£430 (a)**

Epson LX-80 NLQ: A new low-cost high performance dot matrix printer from Epson. Its many features include Near Letter Quality, Draft mode, programmable characters, a variety of print styles, graphics etc. Supplied with friction feed.

LX-80 **£219 (a)** Optional Tractor Feed **£20 (c)**

Epson JX80 ColourA full colour dot matrix printer with colour text and graphics as well as many advanced printer features.

JX80 Colour **£475 (a)**

KAGA NLQ PRINTERS
A top quality yet very competitively priced printer with a Near Letter Quality mode. Includes all the features of Epson FX and uses the same control codes. Extra socket provided on the pcb for installing either 8K RAM or 8K EPROM for custom made font.

KP810 (80 col) **£235 (a)** KP910 (156 col) **£339 (a)**

SEIKOSHA SP-10000
A low cost attractively packaged printer includes many novel features including NEAR LETTER QUALITY mode and automatic single sheet loading. Variety of fonts, 100 cps, both friction and tractor as standard.
Seikosha SP-1000 £189 (b)

BUFFALO 32K Buffer for EPSON PRINTERS

This compact 32K buffer can be fitted internally on any EPSON printer within a few minutes. It does not require external power or any modification to the printer. It will hold about 15 A4 pages of text freeing your computer for other jobs in a fraction of the time it would normally have to wait for the printer to finish all that printing. Supplied with full fitting instructions.
Buffalo 32K Buffer £75 (d)

DAISY WHEEL

BROTHER HR15: * 14 cps * 3K Buffer * Two colour printing * Proportional spacing * Underline * Bold * Shadow print * Super/Sub script + many other features.

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We now offer an extended range of peripheral sharers to allow the user to switch between computers, printers and modems. High quality switching mechanisms housed in fully shielded metal cases ensure reliability. No external power input required.

All lines on the sharers are fully switched (36 on parallel and 25 on serial)

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2 Computers/2 Printers x-over	36V36-X **£69 (c)**	25V25-X **£69 (c)**
BBC Cable Set 3 to 1 (1m ea.)	**£32 (c)**	**£34 (c)**
BBC Cable Set 4 to 1 (1m ea.)	**£39 (c)**	**£41 (c)**

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1 computer to 2 printers fitted with Cable for BBC TCS26 **£19.50 (c)**

GRAPHICS PLOTTER

Basic 3 colour flat bed plotter **£270 (a)**
Opto Sensor **£78 (d)** Drill Router **£79 (c)**
Basic Plotter can be powered from BBC psu
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BREAK-LOCK

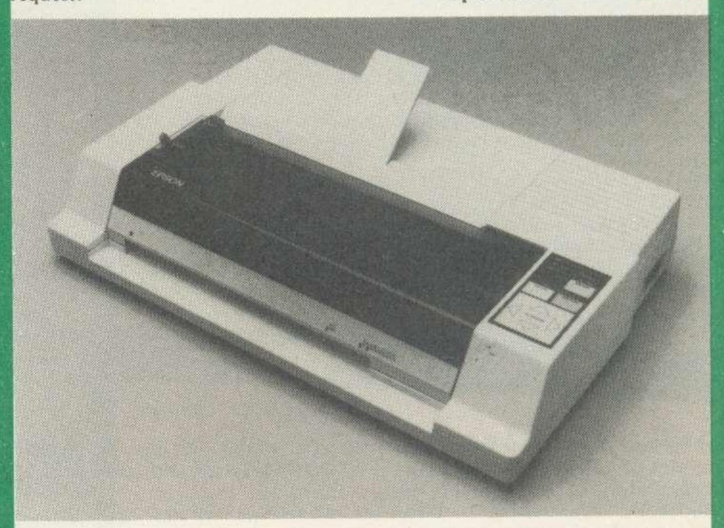
A two-position key switch, fitting into the 'Ash-tray', that prevents accidental/unauthorised use of the Break key. **£8.50 (c)**

PRINTER ACCESSORIES

EPSON
FX80 plus sheet feeder **£129 (b)**; LX80 sheet feeder **£49 (b)**
Paper Roll Holder **£17 (d)** FX80 Tractor Attachment **£37 (c)**
Interfaces: 8143 RS232 **£28 (c)**; 8148 RS232 + 2K **£57 (c)**;
8132 Apple II **£60 (c)**; 8165 IEEE + Cable **£65 (c)**.
Serial & Parallel Interfaces with larger buffers available.
Ribbons: RX/FX/MX80 **£5.00 (d)**;
RX/FX/MX 100 **£10 (d)**; LX80 **£6 (d)**
Spare pens for H180 **£7.50/set (d)**
KAGA TAXAN: RS 232 Interface + 2K buffer **£78 (c)**;
Ribbon KP810/910 **£6 (d)**
JUKI: RS232 Interface **£65 (c)**; Spare Daisy Wheel **£14 (d)**;
Ribbon **£2.50 (d)**;
Sheet Feeder **£182 (a)** Tractor Feed Attach **£129 (a)**
BROTHER HR15: Sheet Feeder **£189 (a)** Tractor Feed **£99 (a)**
Ribbons Carbon or Nylon **£4.50 (d)**; Red Correction Ribbon **£2 (d)**
BBC Printer Lead: Parallel (42") **£7 (d)**; Serial **£7 (d)**
Printer Leads can be supplied to any other length.
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Dust Covers: FX80 **£5.50 (d)**, FX100 **£7.50 (d)**, Kaga KP810 **£6 (d)**, KP910 **£7 (D)**

EPSON HI-80 PLOTTER

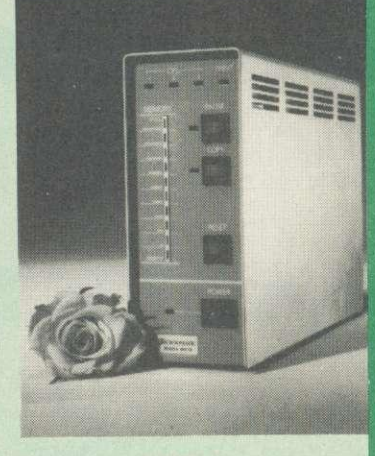
EPSON technology has once again scored a first by introducing a sophisticated A4 size plotter that does not need specialised software or programming skills to operate it and yet keep the cost within the reaches of all computer users. Features include 4 pens at a time — upto 10 colours to choose from, a variety of pen nibs, high speed plotting. Powerful software command codes include single commands to plot circles, ellipses or triangles. Line or bar graphs and pie charts can be plotted in a variety of exciting styles very simply by keying in the data into the computer. Detailed leaflet on request.
Epson Hi-80 Plotter £345 (a)



PRINTER SHARER/BUFFER

A unique sharer/buffer that provides a simple solution to improve system utilisation. It can be connected to up to three computers and it will automatically switch between the computers to scan for data — no manual switching required. High speed data input rate to the buffer cuts down the normal waiting time for the computers for the printing operation to complete and thus allowing the computers to be used for other uses. The 64K buffer would hold over 30 A4 pages of text.

Facilities include: COPY, PAUSE AND RESET. LED indication for percentage of memory available and data source. Mains powered. Send for detailed specification.



TSB 64 Buffer/Sharer **£199 (a)**
BBC Cable Set **£30**

MONITORS

All monitors supplied with BBC lead

MICROVITEC

All 14″ monitors now available in plastic or metal cases, please specify your requirement.

14″ RGB		14″ RGB with PAL & Audio	
1431 Std Res	£185 (a)	**1431** AP Std Res	£205 (a)
1451 Med Res	£240 (a)	**1451** AP Med Res	£280 (a)
1441 Hi Res	£385 (a)	These monitors can receive TV programs thru a Video Recorder	

Swivel Base for Plastic 14″ Microvitecs **£20 (c)**

20″ RGB with PAL & Audio

2030CS Std Res **£380 (a)** **2040CS** Hi Res **£685 (a)**

KAGA TAXAN 12″ RGB

VISION II Hi Res **£240 (a)** **VISION III** Plus **£330 (a)**

SUPERVISION III Plus £360 (a)

MITSUBISHI 14″ RGB Med RES IBM & BBC Compatible **£229 (a)**

SANYO CD3125NB 14″ RGB Std Res **£159 (a)**

MONOCHROME MONITORS:

SANYO DM8112CX Hi Res 12″ Green Screen	£90 (a)
KAGA KX1201G Hi Res 12″ Etched Green Screen	£95 (a)
KAGA KX1203A Hi Res 12″ Etched Amber screen	£105 (a)
PHILIPS BM7502 12″ Hi Res Green Screen	£75 (a)
PHILIPS BM7522 12″ Hi Res Amber Screen	£79 (a)
Swivel Base for Kaga Monochrome fitted with Digital Clock	£21 (c)
Monitor Plinth for the BBC	£13.50 (b)
Double Tier Plinth for BBC and flat pack dual drive	£19.50 (b)

BBC Leads Kaga RGB **£5(d)** Microvitec **£3.50 (d)** Monochrome **£3.50 (d)**

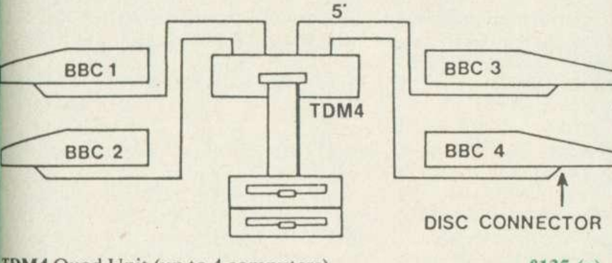
Multi Output Video Adaptor: Allows up to 4 RGB Monitors to be connected to the BBC. Fully buffered **£48 (d)**

TOUCHTEC-501

Designed for use with Microvitec metal cased monitors, and using the RS-423 socket, this unit brings genuine touch-screen operation to your BBC. Ideal for the educational market. Supplied with a users handbook and utilities disc containing starter programs and development software. **Touchtec 501 £260 (b)**

DISC DRIVE MULTIPLEXER

The cost-effective alternative to networking! A self-contained unit that enables up to four computers to be connected to one single or dual disc drive. No hardware modifications — simply plugs into the computers disc interface connectors. No ROMs or other software needed. All DFS commands work as normal. The switching of drives between computers is totally automatic and completely invisible to the user. This unit is ideal for installing in classrooms and other situations, where networking is not planned or necessary, or where costs must be kept low. In many cases software needs to be shared, although full networking complexity and cost is not needed. Several of these units can be connected in series to allow more computers to access the same discs, i.e. two quads connected together will allow 7 computers to share 1 drive. Units are supplied with 5′ of cable per outlet as standard. Mains powered.



TDM4 Quad Unit (up to 4 computers) **£135 (a)**
TDM2 Dual Unit (2 computers) **£75 (b)**

DISC ACCESSORIES

Single Disc Cable **£6 (d)** Dual Disc Cable **£8.50 (d)**

DISC STORAGE CASES

10 Disc Library Case **£1.80 (d)** 30 Disc Case **£6.00 (c)**

LOCKABLE CASES

40 Discs **£14 (c)** 70 Discs **£15 (c)** ſ13710 Discs **£16 (c)**

DISC DRIVES

TECHNOMATIC drives are fitted with high quality slimline Japanese mechanisms and represent the state of the art in drive technology. The drives are built to the highest standards and are tested to their full performance capability before packaging.

Single drives are available with or without integral mains power supply. The dual drive power supplies are switch mode type and are generously rated to ensure minimum heat generation over long periods of operation. All drives with integral power supply are fitted with a mains indicator.

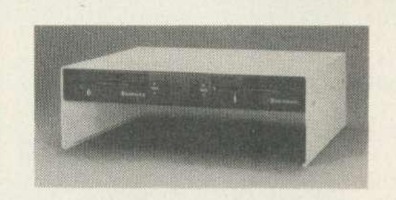
The drives are housed in attractively designed metal casings painted in hard wearing BBC matching paint. The dual drives can be supplied in stacked version or with built-in plinths. The plinth version cases are of sturdy construction to carry any monitor and provide a simple method of having a compact computer installation.

The 80T drives are supplied with the 40/80 track switching modules at no extra charge. The 40/80 track switches are conveniently positioned in the front on dual drives to enable easy switching between the tracks.

All drives are supplied with all the necessary cables, manual and a formatting disc. The mains powered drives are also fitted with a 13A mains plug suitably fused. The drives are ready to be fitted to the computer. All drives are capable of operating in single or double density modes.







Single Drives:			**With integral psu:**	
1 × 100K 40T SS	: **TS100**	£79(b)	**PS100**	£99 (b)
1 × 400K 80/40T DS	: **TS400**	£99(b)	**PS400**	£120 (b)

Dual Drives: (with integral psu)

Stacked Versions:		Plinth Versions:	
PD800 2 × 400K 80/40T DS	£209(b)	**PD800P**	£245 (a)

3.5″ Drives:

These compact drives, used with most of the new 16 bit micros offer fast access times and high performance with minimum of power consumption. The mechanisms are 80 track double sided and are capable of both single and double density operation. The single drive is offered in a dual case with a blanking plate for future upgrading. The drives come complete with cables, manual and formatting disc.

TS35 1 × 400K 80T DS **£99 (b)** **TD35** 2 × 400K 80T DS **£172 (b)**

Separate cased power supply £20 (c)

3M FLOPPY DISCS

Authorised Distributor
Data Recording Products

3M

Industry standard high quality discs with guaranteed error free performance for life. Discs in packs of 10:

5¼″ DISCS

40 T SS DD £13 (d) 40 T DS DD £18 (d)
80 T SS DD £22 (d) 80 T DS DD £24 (d)

3½″ DISCS

80 T SS DD £30 (d)
80 T DS DD £38 (d)

Egon Ronay's JUST A BITE Guide FREE with two special 10-boxes of 3M diskettes. Limited Offer

DRIVEHEAD CLEANING KIT

The **FLOPPICLENE** drive head cleaning kit is an ideal way to ensure the optimum performance of your drives. The use of disposable cleaning discs eliminates the risk of contamination and abrasion of sensitive driveheads. These risks are normally inherent in the reusable drivehead cleaning kits.

Floppiclene with 20 disposable cleaning kits. £14.50 (b)

TECHNOMATIC

01-208 1177

BBC Computer & Econet Referral Centre

MAIL ORDER
17 Burnley Road
London NW10 1ED

RETAIL SHOPS
15 Burnley Road
London NW10 1ED
Tel: 01-208 1177
(close to Dollis Hill ⊖)

West End Branch
305 Edgware Road
London W2
Tel: 01-723 0233
(near Edgware Road ⊖)

TECHNOLINE
24 hour Viewdata
Service 01-450 9764

Orders welcome from government depts & educational establishments.

All prices ex VAT
Prices are subject to change without notice

Please add carriage
(a) £8 (Datapost)
(b) £2.50
(c) £1.50
(d) £1.00.

COMMUNICATIONS

MINOR MIRACLES WS2000 A world standard modem, having BT approval, covering V21, V23, (BELL 103/113/108 outside the UK) and including 75,300,600, 1200 Baud ratings. What possibly gives this modem its biggest advantage is its option of computer control. A 25Way RS232 input as well as possible computer controlled auto/dial/auto-answer makes this modem unique. **WS2000 £129 (c)** BBC Serial Cable **£7.**

WS2000 Auto-Dial card: includes an integral loudspeaker for monitoring of the phone line
BBC User Port cable (for modem control) **£4.**

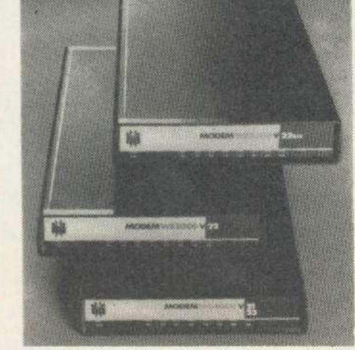
SKI KIT (Allowing total control of the modem by your computer) **£10.**

DS1 Disc (for Commstar): When used with the Auto-dial card, SK1 Kit, and a user port cable, this software will dial out to Prestel, enter your password etc. and leave you in Commstar. Will also store many bulletin board telephone numbers and protocols for autodialling **£10.**

WS2000 Auto-Answer Card £30(d).
(Please note that the A/D & A/A Cards are still awaiting BABT Approval.)

DATA-BEEB An advanced communication ROM from Miracle Technology. Its many features include both Viewdata (Prestel) and Terminal modes, Auto-Answer and Auto-dial for fully expanded WS 2000's etc. Macro facilities allow flexible use of its many facilities e.g. automatic dialling, log-on, going to a specific page, printing it, and going off-line, all in one operation. **£25 (d)**

NEW WS-3000 RANGE — the new professional series. All are intelligent and 'Hayes' compatible, allowing simply 'English' commands to control its many features. All models feature Auto-Dial with 10 number memory, Auto-Answer, Speed Buffering, printer port, data security option etc. All models are factory upgradeable.



WS3000 V2123 (V21 & V23 + Bell) **£295 (a)**

WS3000 V22 (as above plus 1200 baud full duplex) **£495 (a)**

WS3000 V22bis (as above plus 2400 baud full duplex) **£650 (a)**

The WS3000 range all have BT approval.

BUZZ BOX This pocket sized BT approved modem complies with V21 300/300 baud and provides an ideal solution for communications between users, with mainframe computers and bulletin boards. Suitable for use with Open University computer. Battery/mains powered.
Buzz Box £60 (c) Mains Adaptor **£10 (d)** BBC Data Lead **£8 (d)**

COMMSTAR An ideal communications Rom. Extremely easy to use, yet very versatile. It features both a Prestel mode as well as a Terminal mode, thus offering very good value for money. In Prestel mode, all normal Prestel features are available including, downloading of software, saving and retrieving of pages on disc, page tag, revealing of hidden text etc. Its terminal mode is ideal for bulletin boards etc. Any type of file, (not just ASCII) may be sent using XModem protocols. Even includes an elapsed time clock. **£27 (d)**

TERMULATOR An advanced terminal emulator on a 16K Rom. Emulations include VT52/100, Tektronix 4010 etc. Allows a BBC to be used as a terminal for almost any mainframe computer or computer network. **£30 (d)**

COMMUNICATOR This is a full 80 col VT100 terminal emulation program on 16K eprom. It is a more advanced program than TERMI and features easy to follow screen menus. The rate at which data is sent or received is easily set up with rates up to 19200 Baud with 80 column text. Allows files to be transmitted from disc, or a copy of incoming data to be sent to a file or to a printer. (Communicator is not suitable for PRESTEL). **£57 (d)**

REAL-TIME CLOCK CALENDER

A low cost unit, allowing the facilities of units costing far more. Built to professional standards, it opens up the total spectrum of Real-Time applications. Possibilities include desk diary/planner, calender, continuous display of on-screen time and date information, automatic document dating, precise timing and control in scientific applications — its uses are endless. Simply plugs into the user port — battery backup is supplied as standard. A full manual as well as extensive software including a simple demonstration diary/planner application program on disc. **£29 (c)**



EPROMER II



A sophisticated eprom programmer that handles the full range of popular single rail eproms (incl 27256) and allows the user full control of the programming process.
Its powerful menu driven software makes the programming of eproms simple, efficient and eliminates the need to have fiddly switches for selecting eprom types, programming voltage or method. The features include:

* Integral power supply ensures no power drain from the computer.
* Interfaces through 1 MHz bus, fully buffered.
* Clear and simple instructions displayed on the screen make the programming easy for both the first time user and the advanced user.
* Eproms upto 16K (27128) programmed in single pass.
* Selectable programming voltage 25/21/12.5V
* Selectable programming method — normal or high speed algorithmic. High speed programming enables 27128 to be programmed in just over 2 mins. Normal programming skips addresses with FF data to increase programming speed. Automatic verification on completion of programming.
* User can select any section of the eprom from a single byte to its full address range to Blank Check/Read/Program/Verify enabling program development/changes very simple.
* Full screen editor with HEX/ASCII input.
* Full tape/disc filing facility. Data input from keyboard/ Tape/Disc/Eprom.
* Constant display of all options selected.
* Several BBC BASIC programs can be entered on a single eprom.
* Checksum facility allows for easy identification of programmed roms.
* Enter OS Commands from within the epromer program.

EPROMER II with Manual & Software on disc **£99 (b)**
ROM based software **£10**

UV ERASERS

UV1T Eraser with built-in timer and mains indicator. Built-in safety interlock to avoid accidental exposure to the harmful UV rays. It can handle up to 5 eproms at a time with an average erasing time of about 20 mins. **£59 (b)**

UV1B as above but without the timer. **£47 (b)**

ROM/RAM EXPANSION SYSTEMS

ARIES B-32 BOARD: Features 32K of RAM and a 16K ROM socket. RAM can be configured as 20K or 16K as shadow RAM and 12K or 16K or 32K sideways RAM. New commands include comprehensive sideways ROM/RAM management system, simplified direct access to screen RAM and the ability to move/swap the contents of any area of memory. ROM/RAM management system allows RAM allocation, list ROMs, load sideways RAM, disable ROMs, and extend any buffer including printer buffer.

AIRES B32 RAM BOARD **£80 (d)**
ARIES B12 ROM BOARD **£40 (d)**
ARIES B12C Adaptor Board for B12 **£7.50 (d)**

ATPL SIDEWISE ROM EXPANSION BOARD A well constructed expansion board, simple to instal and requires no soldering. All buses are buffered. It allows full sideways rom expansion to 16 ROMs. One socket has been split into two 8K sockets to allow the use of 8K CMOS RAM. Battery backup option allows data retention in the RAM when the computer is switched off. Several link selectable options including write protect for the RAM. ATPL Board **£39 (d)** Battery Backup Kit **£18 (d).**

COMPUTER VILLAGE CV-16 Rom Board **£42 (d)**

RAMROM-15 The advanced sideways ROM/RAM expansion system. This is an external unit, using high quality construction, attractively packaged in a BBC coloured metal case, allowing easy access to all the sockets. No soldering is required. Allows 11/12 additional sideways ROMs to be fitted with an option of up to 16K sideways RAM. All commonly available RAM can be used i.e. 4801/6116/6264 or xx128. Battery back-up fitted as standard. For development work and further expansion, most of the 6502 processor signals are available. Supplied with utility disc and full instruction manual. **£86 (b)**

ROMs/SOFTWARE

WORD-PROCESSORS

VIEW Acorn's version V2.1 word processor rom. £48 (c)

VIEW VERSION V3.O Also compatible with BBC + Complete with Printer Driver Generator. £78 (c)

HI VIEW Disc based version of VIEW word processor for use with the 6502 2nd processor. Allows 47K of user memory. £52 (c)

VIEW INDEX Disc based program to create an index from VIEW text files. Ideal for anyone concerned with writing extensive reports or books. £13 (d)

WORDWISE £34 (d)

WORDWISE PLUS The new advanced Wordwise on a 16K eprom, for the more specialised users who require added features and flexibility. Four new programs are also supplied allowing mail-merging, index generating, two-column text printout and continuous processing. £49 (d)

SPELLCHECK-I £15 (d)

SPELLCHECK II A ROM based fast machine code program that works with both VIEW and WORDWISE. Vocabulary disc supplied with 6000 words can be expanded to well over 17,000 words on 100K drive. Fully compatible with 6502 second processor. £24.50 (d)

SPREADSHEETS

VIEWSHEET Acorn's spreadsheet provides 255 columns and 255 rows and will operate in any mode. Windows can be created which can then be rearranged to provide any print format required. Function keys provide for easy entry of commands. Printer control codes can be used using the printer driver. Fully compatible with VIEW and the 6502 2nd Processor. £48 (d)

ULTRACALC 2 This enhanced version of the original BBC Publications popular spreadsheet ROM includes many new features including full compatability with the 6502 2nd processor running as HiCalc allowing 44K of user memory, operate in any mode, greater flexibility in printer control, spooling as ASCII file etc. All these features are in addition to the existing powerful features such as handling of labels and numbers as values. Column width control and features normally found in well designed spreadsheets. £52 (d)

INTERSHEET The new spreadsheet from Computer Concepts. Many advanced facilities including 105 character display, several spreadsheets may be used at once, may be used with View & Wordwise etc. etc. £49 (c)

INTERCHART Graphics Package for the Intersheet. £32 (d)

LANGUAGES

META-ASSEMBLER (full details on page 1) £126 (c)

6502 DEVELOPMENT PACKAGE A Macro-Assembler with utilities for use with the 6402 2nd Processor. Enables the serious programmer to develop large programs in assembly language. £43.35 (d)

ISO-PASCAL Acorn's full implementation of International Standard Pascal on two 16K ROMs. Disc Version for use on 6502 2nd Processor also supplied. Comprehensive manual. £60 (c)

ACORN LOGO A full implementation of the Logo language from Acornsoft. Supplied as two ROMs with a tutorial course and technical manual. £60 (b)

LOGOTRON logo £57 (c)

BCPL A full implementation of the BCPL compiler language consisting of the language of ROM, disc containing the BCPL compiler, a screen editor, a 6502 assembler, other utilities and programming aids and examples of BCPL code and a 450 page manual. £52 (b)

BCPL CALCULATIONS PACKAGE Supplied on disc, it supports floating point, fixed point and fast integer calculations. It includes the BCPL calcultion files, example files and a comprehensive user guide. £17.30 (b)

BCPL STAND ALONE GENERATOR Utilities in this package enable the programs developed using the BCPL ROM to be converted so that they can be run on any BBC micro whether it has a BCPL ROM or not. Stand alone programs for other 6502 based systems can also be developed. £43 (d)

ACORN LISP Rom £43 (d);

FORTH £43 (d);

COMAL £43 (d)

MICROTEXT The authorising system from the National Physical Laboratory. **Disc** £53 (b) **Cassette** £43 (b)

G:FORTH An advanced implementation of FORTH which follows the 79-Standard specification on a 16K ROM and has a full double number extension set. It incorporates an editor, 6502 assembler, very fast turtle graphics and supports extensive string and file handling. It contains 540 predefined words including those for reading joystick ports, produce sounds, set and read the time and produce random numbers. Fully compatible with disc or tape filing systems and works in any mode. Package comes complete with a USER GUIDE, Introduction to FORTH and 16K GFORTH ROM. £41 (d)

OXFORD PASCAL A fast, compact P-Code compiler, that fully utilises BBC Graphics and sound, contains a powerful editor, and produces 'standalone' software. £43 (c)

UTILITIES

ACCELERATOR From Computer Concepts — Finally, a comprehensive compiler that will compile existing BBC Basic programs, simply, and in most cases, without alteration. Compiles to either intermediate code or machine code. Supplied with two Roms, manual, utility disc etc. £56 (d)

SPEECH ROM From Computer Concepts — allows infinite speech with the Acorn speech system using simple * commands. Pitch and emphasis can be altered — even singing is possible! £29 (c)

SPEECH PROCESSOR ROM £12 (d)

DISC DOCTOR Computer Concept's popular disc utility ROM which adds 20 commands to the DFS system. £26 (d)

GRAPHICS ROM £24 (d)

PRINTMASTER The ROM that features the most versatile screen dumps for the Epson MX/RX/FX80 and KAGA PRINTERS. Includes mode 7, magnification, character definition, enlarged text, etc. — in short — this ROM does it all! £27 (d)

BROM The new utility ROM from Clares — a Toolkit ROM that gives you full screen editing. Many extra functions are included. £28 (d)

REPLICA II 40 & 80 Track Versions available. £9.75 (d)

EXMON-II Advanced M/C Monitor. £22 (d)

TOOLKIT Adds 27 new commands to BBC Basic. £21 (d)

SLEUTH Basic Debugger £21 (d)

HELP ROM based comprehensive on screen HELP facility to aid and speed up programming. £19 (d)

DUMPMASTER Disc based dumps for many printers. £9 (d)

HERSEY CHARACTER Font generator £11.00 (d)

BILLBOARD A useful program that enables your BBC to produce superlarge 'Billboard' type characters i.e. a continuous horizontal scrolling of super-large characters. £15 (d)

DISCMASTER Disc Utility. £15 (d)

BEEBUG SUPERPLOT Cass £7.50 (d) **BEEBUG DESIGN** £15 (d)

MUROM Music Development ROM. £17 (d)

When ordering software on disc please specify track format (40/80)

BOOKS

(No VAT, p&p £1.50 per book)

CPU/Assembly Language Books
6502 Assy Lang Prog.......£19.95
6502 M/C for Beginners.......£ 5.95
6502 Advanced Programming.......£11.95
6502 Programming.......£13.95
6502 Reference Guide.......£ 9.95
8086 Book.......£23.95
Z80 Applications.......£14.50
Advanced Z80 M/C Prog.......£12.95
6809 Assy Lane Programming.......£ 8.95
Programming the 8086/88.......£14.95
CPM Handbook.......£ 9.95
Mastering CP/M.......£ 9.95
Programming the 6800.......£19.95
Programming the Z80.......£16.95
Z80 Ass./Lang Prog.......£19.95
8087 Applications and Programming (IBM) PC.......£22.70

LANGUAGES
BBC Micro Sideways Roms B. Smith.......£ 9.95
FORTRAN Cookbook.......£ 8.00
ISO Pascal Acornsoft.......£12.50
COMAL.......£12.50
Interfacine and Robotics.......£15.95
Understanding DBase II.......£18.95
Wordstar Made Easy.......£16.95
Intro CP/M on Z80 2nd Processor.......£ 9.95
Sanyo MBC 550/555.......£13.95
Basic Rom User Guide (Adder).......£11.95
Introduction to PASCAL.......£16.50
Prog the Micro with PASCAL.......£ 8.50
The UNIX Book.......£12.50

BBC Micro Books
Books for Beginners:
BASIC programming on the BBC — Cryer.......£ 5.00
BBC BASIC.......£ 4.00
BBC BASIC for Beginners.......£ 4.00
BBC Micro for Beginners.......£ 4.75
Century Computer Prog.......£ 9.95
Drawing Your Own BBC Programs.......£ 6.95
Easy Prog for the BBC Micro.......£ 5.00
Friendly Computer Book.......£ 3.50
Gateway to Computing BBC1.......£ 4.95
Gateway to Computing BBC2.......£ 4.95
Introducing the BBC Micro.......£ 4.50
Mathematical Programs in BBC Basic.......£ 7.95

Languages/Programming
30 Hours BASIC.......£ 6.95
Advanced User Guide.......£12.50
Adv BASIC Rom User Guide.......£ 7.50
Advanced Prog Tech for BBC.......£ 8.95
Applied Ass./Lang on the BBC.......£ 7.95
Ass./Lang Made Easy for BBC.......£ 5.95
Assy. Lang. Prog. made easy.......£ 5.95
Applied Assembly Lang on BBC.......£ 7.95
Applied Ass./Lang on the BBC.......£ 9.95
BBC Micro Advanced Programming.......£ 9.95
BBC Micro Sideways ROM's RAM's.......£ 9.95
BCPL User Manual Acorn.......£15.00
Creative Assembler on BBC.......£ 5.95
Discovering BBC M/C.......£ 6.00
Guide to the BBC ROM.......£ 9.95
Exploiting BBC BASIC.......£ 6.95
FORTH Acorn.......£ 7.50
Further Programming for BBC.......£ 4.00
LISP Acorn.......£ 7.50
Programming the BBC.......£ 6.50
Structured Programming.......£ 6.50
S-PASCAL Acorn.......£ 7.50
Using BBC BASIC.......£10.00
Word Processing on BBC (Wordwise + Epson).......£ 5.25

SOUND & GRAPHICS
Advanced Graphics with BBC.......£ 6.00
BBC Graphics & Sound.......£ 7.50
BBC Micro BASIC, Sound & Graphics.......£ 7.50
Creative Sound on the BBC.......£ 9.95
Graphics on the BBC Micro.......£ 6.00
Turtle Graphics.......£ 7.50

EDUCATIONAL
BBC Micro in Education.......£ 6.50
Prog for Education (Pri.Sch).......£ 5.95

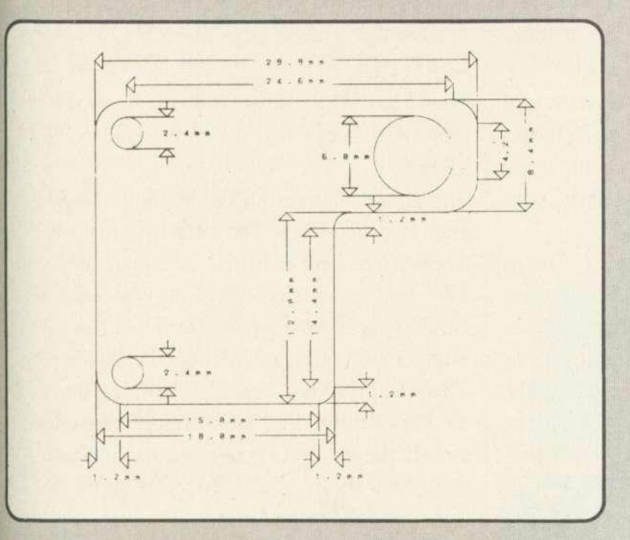
DISC DRIVE SYSTEMS
Advanced Disc User Guide.......£14.95
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Disc Book.......£ 3.50
Disc Programming Techniques.......£ 7.95
Disc Systems.......£ 6.95
Using Floppy Discs.......£ 6.95

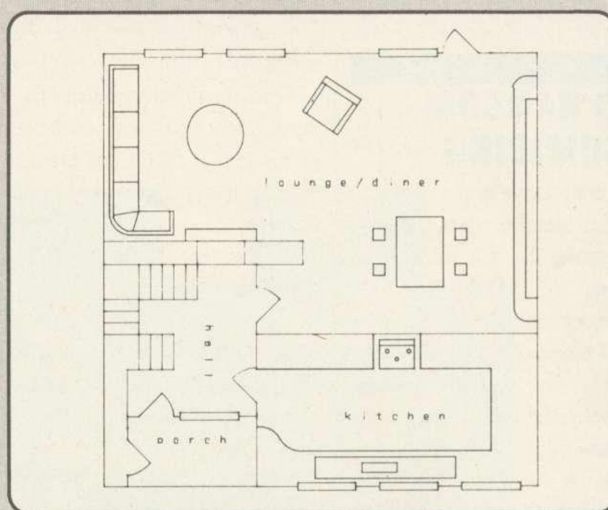
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BBC Software Projects.......£ 6.95
Business Programming on BBC.......£ 7.95
Business Applications on BBC.......£ 7.95
DIY Robotics & Sensors.......£ 6.95
Interfacing Projects for BBC.......£ 6.95
Making Music on the BBC.......£ 5.50

GAMES
100 Programs for the BBC.......£ 6.00
BBC User Guide Acorn.......£15.00

MISCELLANEOUS BOOKS
6522 VIA Book.......£ 4.50

NOVACAD
Computer Aided Draughting for the BBC Micro





A sophisticated CAD package with unique facilities which until were confined to custom built CAD packages.

Whether you want to draw a complex electronic circuit diagram or plan your new kitchen or simply draw a cube NOVACAD will help you do it better and more easily.

All you need is a BBC micro model B fitted with Acorn DFs and a single disc drive. If you have a 6502 2nd processor and a dual disc drive then NOVACAD's capabilities are further enhanced.

* Very user friendly with all commands and controls from the keyboard. Special windowing techniques make available to the user almost one million dots allowing a lot more detail to be put on the drawing than one would normally expect the BBC to be capable of. (Mode O screen display only 1/6 the number of dots). The drawing can be 4 windows across and 5 up.
* Libraries of user defined ICONS such as electronic symbols can be created easily and edited even in the middle of drawing another diagram. ICON size is not limited to a number of pixels. An ICON can contain up to 500 lines, so complete drawings or sections of large drawings can be saved as ICONS for use with other drawings.
* ICONS can be called by name from a library into any part of the diagram and can be moved, enlarged, reduced, rotated in 90° steps and have mirror images made before being finally positioned.
* The zoom facility allows the user to magnify any section of a drawing by up to 20 times to make it easier to insert details.
* User definable grid helps the user set his own scaling for the drawings.
* Horizontal and vertical displacements can be measured in any user defined scale.
* Any two colour can be used in mode 4.
* Up to '8 levels' can be used to produce multi layer drawings, and then user can decide which levels are to be displayed. This can be particularly used in pcb drawings, architectural drawings with details of the services behind the walls displayed only when required and many other such applications.
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HINTS & TIPS

Martin Phillips looks this month at randomising, how to send user-defined characters to a printer, VDU statements and more

NOT SO RANDOM RANDOMISING

It is quite easy to put a routine into a program so that it has a random element – but there are sometimes good reasons for not having the element truly random.

Take, for example, a simple routine to guess the correct letter. 20 boxes could be placed on the screen – each one with a different letter, and only one unlocking the way to the rest of the program. This task might seem trivial, and a simple random choice sufficient. But if the motive for including such a task at the start of a program is to encourage some familiarity with the keyboard itself, then a simple random routine is far from ideal. It is much more effective if several keypresses have to be made before there is even a chance of the correct box being chosen. This will ensure that every user will get some keyboard practise before being able to proceed.

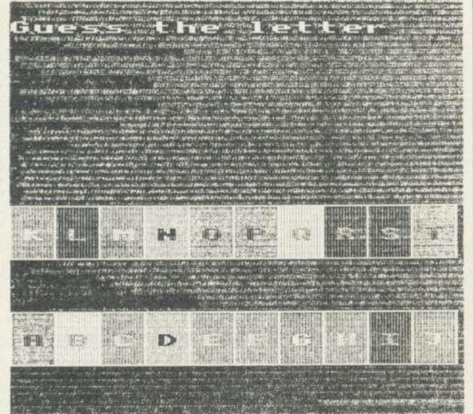
How can this be done? Listing 1 on the yellow pages shows the whole program. Rather than just giving the 'skeleton' of an idea, the whole routine is included, showing many other techniques.

First, to create a pretty screen display, two rows of ten boxes are drawn in random colours, and a white border is placed round each. Then each box is labelled with a letter. This procedure, PROCsetscreen, is the longest. There are several ways of placing coloured boxes on the screen, but the easiest is to define a graphics window, change the background colour, clear the screen, then clear the graphics window. Lines 170 and 180 achieve this. Notice the semi-colons in line 170. These, *not* commas, must be used as each parameter could be a two-byte number. (Each X co-ordinate can be in the range 0-1279, and such a number is two bytes long. A number in the range 0-255 can be stored in one byte.) VDU16 is the alternative way of writing CLG, and VDU26 restores the default windows. GCOL3,2 is used so that, when a key is pressed, the corresponding letter in the box will be overwritten and so disappear.

PROCrun is the not-so-random routine for picking a letter. It works by having the 20 letters stored in the string A$. As a letter is chosen, that character in the string is changed to a tilde '~'. (It comes out as a division sign in mode 7.)

Once ten different entries have been made, a random choice is made of the remaining letters in the string. PROCrnd carries out this selection process, and 'test' is the secret letter number.

As there are 20 numbers initially, it is set to 21 so that there is no chance of a correct guess being made. The letter input routine at lines 370 to 400 is foolproof. No wrong letters or letters already chosen can be accepted, and the routine will take entries in either lower or upper case. (This is the AND 95 part. Using these logical operators was covered in October 1985's Hints and Tips.) The choice of the tilde as the dummy character is so that the input routine will change it to another character which does not appear in the string being checked.



The random letter program produced by listing 1

Once a letter has been accepted by this routine, the variable 'count' is incremented, and the letter is overprinted on the screen to make it disappear. Then A$ is changed, and that letter is replaced by a tilde, so that the computer knows which keys have been pressed.

This is by no means the only possible method, but it illustrates the point simply. If the count reaches ten, then the routine jumps to PROCrnd, where 'test' is set as one of the remaining numbers. PROCrnd first randomises the random number generator so that the same sequence cannot be initiated each time the computer is switched on. Try switching the computer off, then on again, and printing the following line:

```
FOR N=1 TO 10:PRINT RND(100):
NEXT N
```

Then make a note of the numbers. If the off-on procedure is repeated, the same sequence will be given.

Without randomising, every time the program is loaded and run on a newly switched-on machine, the same hidden letter will be chosen. This can be avoided by giving the random number generator a random seed – in this case using TIME acts as an unpredictable seed. Then the procedure keeps on choosing one of the 20 positions, until the corresponding character in the string A$ is not an asterisk. Lastly, there is a short end routine to signal the location of the secret letter.

Once the program has been run, add the following two lines to see exactly how the routine works:

```
455 VDU4,30:PRINTA$:VDU
625 VDU4:PRINT '' "test is letter"
CHR$(64+test):VDU5
```

These will display the string A$, and show how, as a letter is chosen, the string is changed. Then, as soon as a random letter is chosen after 10 entries, it will be displayed on the screen.

PROBLEMS WITH VDU STATEMENTS

One of the more complicated Basic statements on the BBC and Electron computers is the VDU statement. There are over 30 VDU statements which control many of the screen functions. Most of these have different numbers of parameters following them, and it is all too easy to put in either too few or too many following numbers.

One of the not so obvious problems is that the VDU statements are not error trapped. That is to say, there is no check on the correct number or range of parameters. The missing or extra characters often do not affect that VDU statement, but tend to be added to or taken off the next one processed, causing it to malfunction. Most programmers have found it annoying not to be able to change mode inside a procedure. VDU22, used to select a screen mode, can also change the mode inside a procedure.

Listing 2 gives a short routine for drawing a solid polygon, in this case a pentagon. It's shape can be changed by altering the parameter

HINTS & TIPS

following the procedure name at line 80. It's position can also be altered at lines 120 and 130. It's size can be varied at line 140. The program goes into mode 4, and a blue background is set by line 70.

If Break is pressed, and the program is recovered using Old, the mode 4 statement at line 80 can be changed to VDU22,4. Then, when the program is rerun, a series of dots appear at the bottom right of the screen. Even worse things happen if lines 60 and 70 are put between lines 110 and 120. Now garbage appears at the top of the screen, too. This is all because VDU22 does not change the value of HIMEM (which gives the address of the first location Basic does not use). Therefore workspace is allocated for the program in a part of screen memory – hence the moving dots. This can be put right by entering line 55:

```
55 HIMEM=&5800
```

This moves HIMEM down out of the memory area used by the mode 4 screen. Therefore VDU22 can be used in procedures provided the correct value of HIMEM is selected very early on in a program. The best advice, though, is never to attempt to change mode inside a procedure until you are quite sure of what you are doing.

To end the catalogue of VDU horrors as mentioned earlier, no checks are made on the VDU statements, so even a missing comma can cause very odd problems. Go back to listing 1 and ensure that it is working correctly. Now add line 65 as follows:

```
65 VDU23;8202;0;0;0
```

This line will remove the flashing cursor as detailed on page 77 of the BBC User Guide. Now when the program is run, the background colour will remain black. The mistake here is a missing semi-colon at the end of line 65 – it is missing in some versions of the BBC User Guide, too. But notice that no error is reported. However, inserting a semi-colon at the end of the statement will put matters right, for it indicates that the number it follows is a two byte number. Line 30 in listing 1 could be replaced by:

```
VDU19,0,4;0;
```

To change the program to draw an outline shape only, change line 150 to read:

```
210 PLOT 5,X,Y
```

The program will draw solid or outline circles by increasing the number of sides beyond 20.

A PRINTER WITH CHARACTERS

Many of the latest dot-matrix printers can produce user-defined characters and place them in a special buffer in the printer. But some – like the Epson RX80 printers and the equivalent Smith-Corona D100 – do not. It is possible, though, to send one's own characters to these printers. The idea is to use the bit-image mode, which is quite easy, although one would never think so, judging by the handbook!

PROCheart, the procedure in listing 3, prints a heart. The bit image mode is set by using ESC K. This 'translates' to VDU 1,27,1,75. 27 is the ASCII code for 'ESC', and 75 the ASCII code for 'K'. The 'ones' are placed in front to ensure that the next character is sent to the printer only. This ESC K code has to be followed by two more bytes, which give the low followed by the high number of bit image data bytes. This will be set to 8 for compatibility with the Beeb's user-defined characters. The character definitions are similar to that of the user-defined characters, except that the grid is 8 high, and as long as set by the ESC K line.

Figure 1 shows how the heart is drawn. Although similar to the user-defined characters, the definitions are added up vertically (starting at the bottom) instead of horizontally. Note that the ninth dot wire of the printer cannot be used in bit image mode.

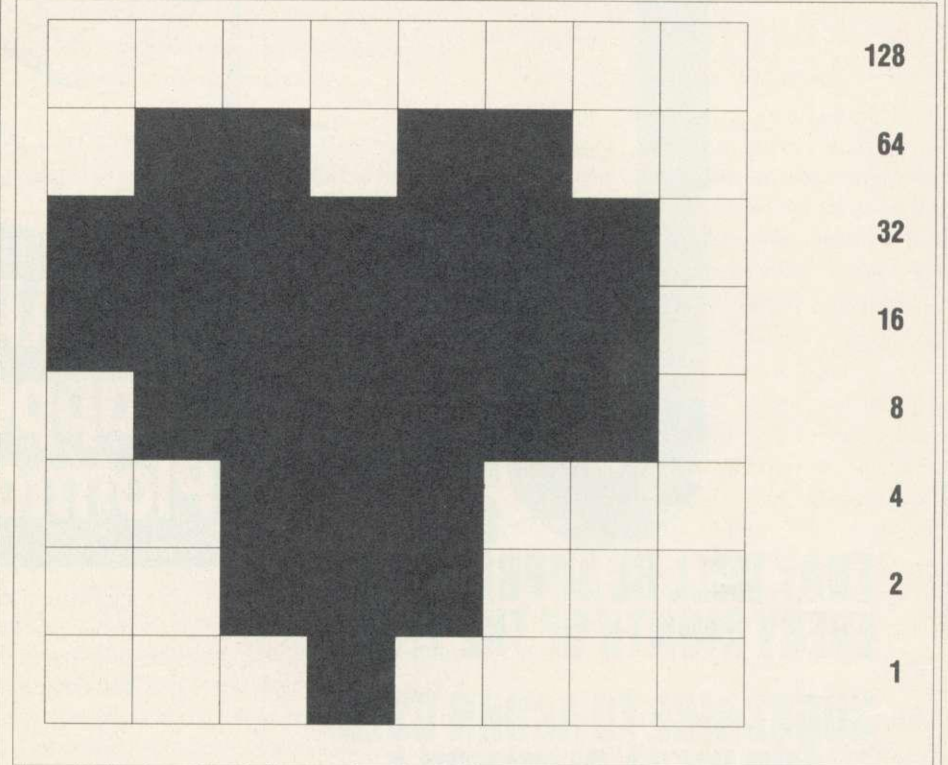


Figure 1. This shows how the heart produced by PROCheart in listing 3, is drawn

Once the eight bytes of data have been determined, they are sent to the printer (lines 140 and 150). The printer will then return to the text mode and carry on printing normally. If it is expecting 8 bytes of data and only receives 7, it will hang up. If it receives more than 8, the extra will be ignored.

Dual-density hearts can also be drawn, using printer code 'ESC L'. Because each vertical row of dots overlaps the previous one, twice as many columns need to be sent. Listing 4 shows how this is done.

Each column is sent twice. The number of bytes sent is changed to 16 in line 130.

It should be possible to write a routine which will manipulate the BBC's user-defined character definitions so that they can be sent to the printer automatically, say from within a program or even *Wordwise*. Any offers?

DISC MENU REVISITED

In September's Hints and Tips, I published an automatic disc menu. Several readers have written in to point out a mistake I made in the program which affects the selection of drive 2. Mr A Forbes of Newcastle wins himself £5 for providing the neatest solution to the problem, and for finding a second bug which I had never considered.

The first mistake I made was to use location &1046 to find the drive number. On Acorn DFS 0.9, 1.2 and 2.0 this location should be

&10CB (line 220 of the listing given on page 97 of September's issue). The first location only works for the Watford DFS. The obvious solution is to change the location to the new one – but then, of course, it won't work on a Watford DFS.

Mr Forbes has provided a more elegant solution using OSGBPB which should work with all DFSs. OSGBPB with A=6 will return the current directory and, although the Acorn Disc Filing System handbook doesn't say so, the drive number. Therefore line 220 should be changed to read:

```
220 drive%=FNdrive
```

and the following lines inserted at the end of the program:

```
1510:
1520 DEFFNdrive
1530 ?&A00=0:!&A01=&A10:X%=0:
Y%=&A:A%=6
1540 CALL &FFD1:=?&A11-48
```

Mr Forbes has also pointed out that the catelogue will only print out 30 entries. This is fine for side 0, but the screen formatting can be upset on side 2 where it is possible to have 31 entries as there is no !BOOT file or Automenu program.

Here the solution is easy. Change the 15 on lines 450, 460, 530 and 540 to 16 to cure this problem.

PERSONALISED WORDWISE

Mr Jackson of Conway, County Antrim, asks if there is any simpler way of personalising *Wordwise* letters than having to type the name in each time.

There are two ways. The first is to use option 5 on the menu, 'Search and Replace'. First type the letter, putting something like 'xxxx' each time the name is required, and save the letter.

Then use option 5 to replace each occurrence of 'xxxx' with the name. Note that this method will require the letter to be reloaded into memory each time, so is only really practical with disc.

The second option requires *Wordwise Plus*. It uses a segement program to look at the first line of text.

I have assumed that this will be the name, and could have been inserted from a mail merge program such as the ones supplied with *Wordwise Plus*. The name and address are stored in the main *Wordwise Plus* text area, the first line being the name with no comma after it according to current practice. Then the letter is put into segment 0, using 'xxxx' in place of the name, as shown in the sample letter below:

Dear xxxx,
Thank you so much for your entry. I am pleased to inform you that you have been selected as one of the winners, and you will shortly be receiving your cheque for £1000 made out in the name of xxxx.

Lastly, change to segment 1 and enter the following short program to combine the two:

```
SELECT TEXT
TYPE CHR$ (13)
CURSOR BOTTOM
TYPE SEGMENT 0
CURSOR TOP
A$=GLT$
REPEAT
REPLACE "xxxx", A$
UNTIL EOT
```

SELECT TEXT means select the normal text area (where the address is already stored). TYPE CHR$(13) will insert a blank line after the address and before the 'Dear xxxx'. More of these can, of course, be inserted to leave a greater gap between the address and the letter. Then the cursor is moved to the bottom of the text, and the standard letter is transferred from segment 0.

Next, the cursor moves back to the top of the full letter, and stores the first line in string A$. So A$ holds the name. Then *Wordwise* searches through the text and replaces each occurence of xxxx with the name, until it reaches the end of text (EOT).

To use this, return to the main menu and press SHIFT-f1. Nothing will appear to happen, but if all has gone well then the letter will have been compiled. The personalised copies can then be printed out and saved if that is what is required. The next letter can be personalised after using the DELETE TEXT command. Take care – this must be used ***only*** once the main text area has been selected or it will wipe one of the segments. The new name and address can either be typed in or loaded from a file.

This illustrates just how useful the Wordwise Plus segments are.

For instance, by a similar technique, headings can be added to letters.

So do take time to experiment with them – they are worth the trouble.

For Martin Phillips' listings, see yellow pages 105-106

QUICKFIRE QUESTIONS

Mr Child from Heathfield has tried to make a *View* !BOOT file that will give him a mode 3 display with green text:

```
MODE 3
VDU19, 7, 2, 0, 0, 0
*WORD
NEW
```

This appears to work, but it doesn't really. The VDU command has to be put in after the *WORD to get the green print, but *View* will not allow this. It can be done, though, by putting the VDU code directly into the keyboard buffer once in *View*:

```
MODE 3
*WORD
*FX138, 0, 19
*FX138, 0, 7
*FX138, 0, 2
*FX138, 0, 0
*FX138, 0, 0
*FX138, 0, 0
NEW
```

If you have more than one FOR. . . NEXT loop that end at the same point, there are three alternate ways of writing the NEXT:

```
NEXT A:NEXT B
NEXT A, B
NEXT ,
```

By not specifying the variable in the NEXT statement, as in the third option, the program is significantly speeded up.

Readers who have machines fitted with Basic 1 will be pleased to hear that it does have some advantages over Basic 2. One advantage is that, although List cannot be inserted as a program line, it can be used with an On Error statement:

```
ON ERROR LIST
```

This will list the program if an error occurs, or if Escape is pressed.

If program space is at a premium (as often happens with programs that use graphics), a little memory can often be saved by using long strings of VDU commands instead of GCOLS, COLOURS, and PRINTTABs. Otherwise, use sparingly as program readability is considerably reduced.

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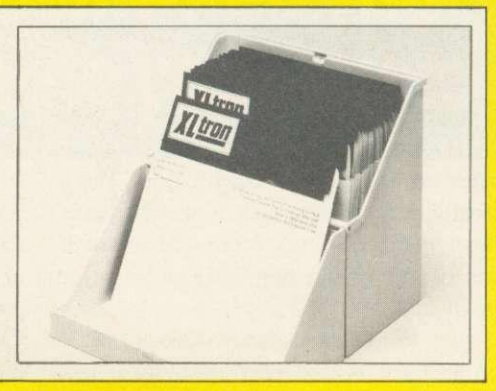
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THANKS FOR THE MEMORY

The different types of memory expansion available for the BBC micro and Electron are explained and examined

Tessie Revivis

When you look at the ads of the now numerous manufacturers of home and business micros, the one thing they all tend to shout about is the amount of memory their machines have. The Electron and BBC micros have never been over-endowed in this particular area, and a couple of rival companies have tried to use this fact in their sales promotion to steer would-be computer enthusiasts away from the versatile Acorn machines and towards their own.

But in most instances, while their claims may be true in theory, in practice they don't hold much water. There are two reasons.

First, BBC Basic is a very versatile language. Programs can be written efficiently without needing much memory.

Second, because of the popularity of these machines, independent dealers have come into the computer market offering a host of plug-in goodies that allow you to expand your computer system. One of the major areas of such expansion has been in add-on memory boards. This is especially the case with the BBC micro, more so than with the Electron; but with the latter's drastic reduction in price, several companies are re-opening their Elk files to meet the demand from Electron owners.

This month, I will look at the ways in which the memory in both machines can be expanded. This should enable you to evaluate your own needs and then refer to reviews in back issues to make the ideal choice.

Shadow RAM

The amount of memory available for a program to operate in will depend on the screen the program uses. The Operating System of both micros use the main memory to 'map' the screen. Just like a more conventional map, individual points can be referred to by a co-ordinate. In the case of the Beeb and Electron, this co-ordinate is an address. The advantage of memory-mapping, as this is called, is that you can change what appears on the screen by altering what is in the memory location.

The amount of detail you can get onto the screen depends on how tightly you can pack the bytes of memory together. This is called the resolution of the screen.

For example, the highest resolution screen modes use 20k of memory – k being short for a kilobyte or 1024 bytes. Now 20k is about one-third of the entire memory, and about two-thirds of that actually available to you for programs. The rest is used to store Basic and the machine Operating System (MOS).

The most obvious way in which memory can be made available is by freeing the screen memory. This is done by the addition of what is termed 'Shadow RAM'.

Readers with the BBC B+ will be aware of this as it is fitted as standard on their machines. Owners of the BBC B machines can purchase a Shadow RAM board.

Once installed, the Shadow RAM board will supply all the memory for whatever screen mode you select, thus freeing for programs the memory on the computer that would otherwise be used for screen memory. For the high resolution modes, this means that you gain an extra 20k for your programs.

When using the lower resolution screen modes – say, mode 4, which only requires 10k to operate – then only 10k of the Shadow RAM is called into operation. It is not possible, though, to use the remaining 10k of the Shadow RAM for your Basic programs. Shadow RAM is only available for screen use.

There are several types of Shadow RAM board. One of the most popular is the Aries B20 board from Aries Computers. Watford Electronics and Ramamp also offer Shadow RAM boards that include extra memory.

One point to bear in mind when looking at a Shadow RAM board is compatibility. If you use your BBC micro for wordprocessing, then Shadow RAM has an immediate effect. More free memory means the capacity to cope with longer documents, and the 80-column mode 3 is always available for use with *View* and with previewing text in *Wordwise*.

As has been said, the BBC B+ already has this extra facility, as does the BBC B+ 128k. However, this Shadow RAM is not at present compatible with existing versions of *View* and *Wordwise Plus*.

The cost of a Shadow RAM board varies slightly, but think in terms of £70 to £80.

Second Processors

Another way in which you can increase memory is to add on more program memory. These are the options . . .

BBC B owners and, shortly, Electron owners can add a 6502 second processor. This is simply a second micro with extra memory – 64k in this case – which plugs into the Tube socket on the underside of the Beeb. Advanced Computer Products are hoping to launch an Electron interface for the 6502 second processor in time for Christmas. When the 6502 second processor is plugged in, it takes control of your micro, which becomes nothing more than a rather sophisticated I/O processor (Input/Output). This means that your Beeb or Electron takes care of the traffic of data going in and out of the micro. Input includes anything you type at the keyboard, any loading of data from disc or tape, etc. Output covers screen display and unloading of data onto disc, tape or other filing system.

This does have a useful consequence. Because your main micro is handling the I/O, the second processor – into which your programs are loaded – can run them up to twice as fast, because it doesn't have to keep stopping and doing the chores already described.

The second processor comes with 64k of memory. Not all of this is available for pro-



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INTERSHEET – The first of the ROM-LINK integrated rom packages from Computer Concepts. Menu driven, 40/80/105 column display, very fast, can be used with View or Wordwise, up to 16 spreadsheet in memory at one time. Supplied on two roms with reference manual, function key strip and quick reference card. **£47.95 (b)**
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MUROM – This music rom from Beebug allows you to create music and sound effects. Some like *ZAP are included. Editing is made easy by use of the music editor. **£26.25 (b)**
ADVANCED DISC TOOLKIT – Probably the most compatible toolkit rom available. It works with the Electron, BBC B, BBC B+, 6502, Z80, DFS, DNFS, 1770 DFS, ADFS. It adds more than 30 extra commands to the BBC. **£33.00 (b)**
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B/E = BBC/Electron

grams, however. You will have about 47k – but I would very much like to see a Basic program that long!

The screen memory is provided by the beeb; the remaining memory within the I/O processor cannot be used for normal Basic programs, but it can be used to store data or run machine code programs.

Running commercial software on the second processor will normally be possible, provided the writers have conformed to the ground rules laid down by Acorn. *View* and *Wordwise Plus* will both be OK. If a program won't run, then the second processor can always be switched off – allowing you to use the Beeb or Electron as normal. The main disadvantage of the 6502 is its cost – about £199. But if speed and amount of useable memory are important, it certainly supplies these.

Sideways RAM

Sideways RAM is another memory facility, but it is not readily available for normal Basic programs. Machine code programs written with a special header, however, can be placed into sideways RAM.

The term 'header' means that the programs have a special starting sequence that must be adhered to.

The BBC micro and Electron both come supplied with a machine Operating System (MOS) and Basic. Both of these are stored in a Read Only Memory (ROM) chip. The MOS controls all aspects of the Beeb and Electron, no matter what type of program you run – reading the keyboard, displaying text on the screen, and so on. Basic is also supplied as a ROM and is in effect a very long machine code program that can interpret and act as defined by a Basic program. Basic itself is under the control of the MOS, and the MOS is capable of controlling up to 15 further ROMs.

In the BBC B, there are three extra ROM sockets into which other ROMs can be placed; on the BBC B+, there are six ROM sockets. The Electron does not have any, but several companies manufacture add-on sockets, including Slogger and ACP.

These ROMs have to be placed somewhere in memory. While finding space for one of them is no real problem, accommodating all the possible 16 is problematic. As each ROM space can be up to 16k long, 16 ROMs could occupy a total of 160k of memory space, which is more than the total 64k memory offered by the Electron and BBC B, and more even than the 128k B+. So these ROMs have been arranged so that they all occupy the same 16k of memory space.

You see, you will only ever require one language at a time, so all you need do is switch in the ROM you require at any given moment. This switching is performed by the MOS. Because these ROMs all occupy the same area of memory, they appear side by side – so are referred to as sideways ROMs.

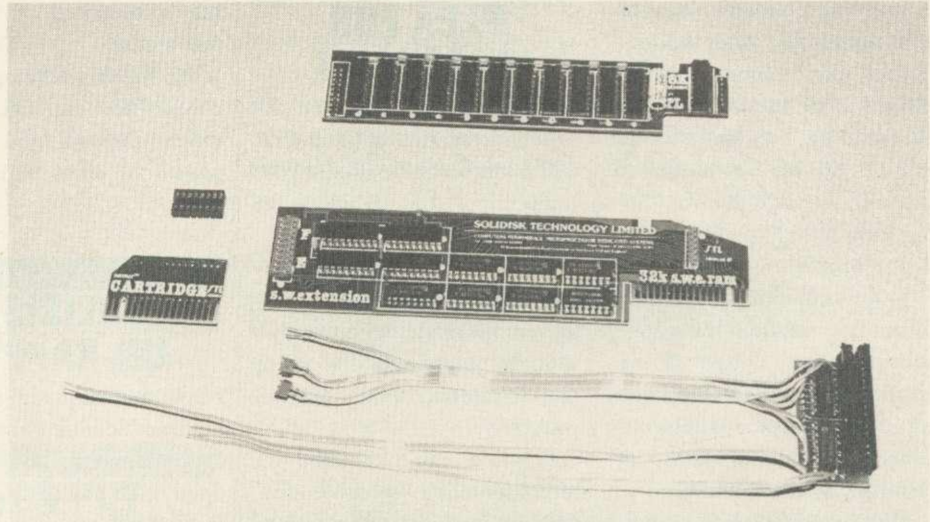
The trouble with ROMs is that they are Read Only Memory. You cannot write to them and store your own machine code programs in them. To counter this, many sideways RAM boards have come onto the market. The first was the Solidisk board and one of the latest is the *Acorn User's* very own *UserRAM*. Once installed, it is possible to write your own sideways RAM programs, save them on disc and load them as required.

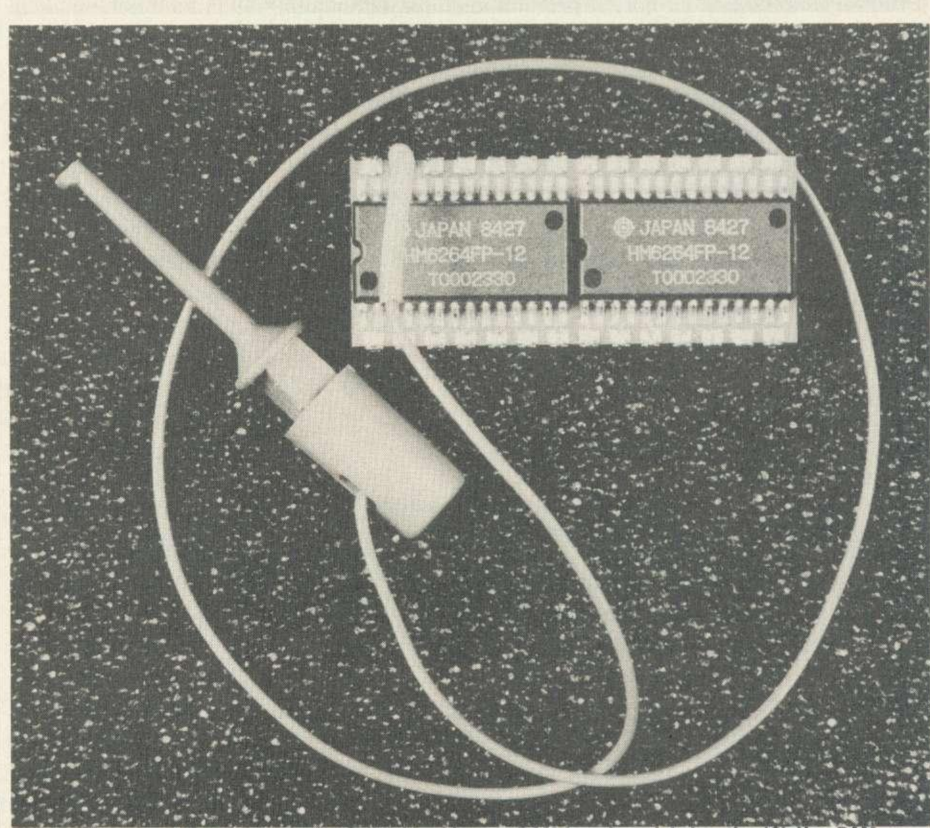
Of course, the 128k B+ already has its own sideways RAMs installed, and these can be used directly. Although in many cases the addition of sideways RAM does not actually increase the overall amount of memory available to Basic programmers, once you become proficient in machine code programming it does; allow you to add new languages and commands to your own micro. Listing 1 on the yellow pages is a complete program for use in sideways RAM and adds a simple *BEEP command to your micro. The listing itself is documented, and explains what is happening.

Reviews

Once you know what type of memory you want, then consult the reviews. The Aries B20 RAM board was reviewed in April '84; sideways RAM boards were looked at in December '85; and sideways ROM boards featured in two issues – April '85 and September '85.

See Tessie Revivis' listing on yellow pages 106-107





At opposite ends of the spectrum, *top*, Solidisk's sideways RAM boards and *below*, the 16k UserRAM

LETTERS

COMPATABILITY AS PROMISED

Sir, I would like to record a hearty 'hear, hear' for the sentiments expressed in the letter from A A Hatley in the September issue entitled 'Small is Beautiful', and to ask that you take up the cudgels on behalf of the small business and education users whom he speaks for very well.

As a headmaster with computer studies, computer awareness courses and considerable computer administration in my school, I do not want number crunching ability nor the extra speed of 16-bit machines. I simply want the magic 'upward compatibility' promised originally by Acorn and, I gather, already partially abandoned in the B+.

There is a great deal of excellent software for the Beeb and more is being produced. I have 12 machines and tragically the next generation would appear to be incompatible with these and my increasing software library.

Yes, we need the 256k memory suggested by Mr Hatley at a sensible price. Let the giants of industry develop machines which will do twice as much in half the time and let us in education and small business have the solid 'work-horse' which will teach children the principles and do the tasks for which they are ideal.

How about a survey of your readers to find out what is wanted and then apply exterior pressure on Acorn to meet the actual requirements of their major customers, rather than developing new generations of machines for technical applause?

A J Bradley
Lancs

PLEA FOR PROGRAMS

Sir, I think it would be a good idea to publish the winning program as well as the correct answer to your competitions. After all, the answer itself is irrelevant.

I'm sure that it would encourage readers to develop better programming skills if they can study a winning program, and it might also increase the number of entries you receive.

Programs can be judged on several criteria – speed of solution, memory used, techniques — and I'm sure that you could decide on a fair and relevant points system. Programs that are well thought-out could be published instead of giving prizes.

Some competitions have led me to develop programs that have become extremely useful utilities – the rapid testing of numbers for factors and the calculation of anagrams of words are just two examples.

I think this would really improve the quality of an already impressive magazine.

M Richards
Sussex

The answer to this query is the age-old *Acorn User* problem of space. If we spend a page printing a solution, what do we throw out?

We would encourage regular competition entrants to get in touch through the free ad pages, or even form a user group.

```
     10 REM Graphics routine
     20 REM by Kevin Stowe
     30 REM BBC B/B+/6502/Basic 1/OS
>1.0/Electron
     40 REM (c) Acorn User December
1985
     50 :
     60 REPEAT
     70 MODE 4
     80 XO=640:YO=512:R=500:A=RND
(100):B=RND(100):C=RND(1000)
     90 MOVE XO+R,YO
    100 FOR I=0 TO 2.1*PI STEP PI/A
    110 X=XO+R*SIN(I*B)
    120 Y=YO+R*COS(I*C)
    130 DRAW X,Y
    140 NEXT
    150 PRINTTAB(0,0)"Press space"
    160 REPEAT UNTIL GET$=" "
    170 UNTIL FALSE
```

Listing 1. Draws 3D symmetrical patterns in mode 4

SOLIDISK UN-RAPPED

Sir, I was surprised to see the headline 'Solidisk Rapped' in the September issue of *Acorn User*. Solidisk Technology is a company in the forefront of computer development whose products make competitors look silly, and which actually cost less and include free disc software. The 'complaints' referred to appear to relate to customer relations and I feel that it would be less than fair if you did not also put on record the other side of the story.

My own disc drive, DFS and sideways RAM were supplied from stock and installed in my computer while I waited. Moreover, when I recently changed an IC on my double-sided computer board and damaged the tracks, Solidisk carried out the highly skilled repair work for no charge at all.

I believe this to be indicative of the high value Solidisk place on customer relations. I wonder if there is any other company in the land who would do this?

R Southgate
Essex

ELECTRON-ICALLY DRAWN 3D

Sir, I would like to congratulate you on your superb magazine. I have read several of the computer magazines available for the BBC micro and was saddened to find that the articles (and letters) were virtually all games oriented. Do the editors of these magazines think that everyone who buys a computer wants it solely to play games? Therefore, it was with great relief that I discovered *Acorn User*.

Listing 1 is a program written on my Electron to draw 3D symmetrical patterns.

I used mode 4 to get good speed but if you want a higher quality, then use mode 0.

Kevin Stowe
Somerset

ULTRA DRIVE SUPPORT

Sir, I am writing to ask (or more likely, beg!) for a utilities program to transfer programs from tape to ultra drive.

Software manufacturers have not woken up to the fact that BBC micro owners actually bought Ikon's ultra drive system and want some programs equal to, for instance, Clare's *Replica II* or Vine Micro's *TD ROM*.

I own an ultra drive and play games, so how about some support from hardware and firmware manufacturers to give us utility programs for transferring slow domestic tape games to ultra drive?

Magazine support is as important as hardware and firmware backup, so how about a special on the ultra drive, as you have done several times on discs?

Ivan Beckingham
Cheshire

Can anybody help Mr Beckingham?

SOFTWARE FOR A NETWORK

Sir, Joe Arrowsmith's letter in your September issue talked of the frustration caused by an apparent lack of Econet software. It may be of interest to your readers that there is a little light on the horizon.

We at XOB have felt for some time that the sophistication of a system like Econet requires the sort of support traditionally associated with mainframe systems, and are attempting, at least partially, to fill the gap.

Our software, specifically for the Econet system, is *Cave*, the first multi-user dungeon adventure for the Econet system; *Network Operator*, a system supervisor's utility giving vast and flexible control of network primitives; *Networker's Friend*, a set of utilities to be added to the library making the system more user-friendly and secure; and *Archive*, which backs up directory trees to standard DFS format.

We have other items in the pipeline and are always interested to discuss the particular requirements of anyone with an Econet system.

If readers would like information on any of these products, or simply to chat about Econet interests and the possibility of setting up a National Econet Users Club, they should write to me at XOB, Balkeerie, Eassie, by Forfar, Angus DD8 1SR or phone (0307) 84364.

Michael Ryan
Angus

PUZZLING OVER PROTECTION

Sir, Not so long ago, I purchased a disc drive for my Beeb and have spent quite a substantial amount of time transferring a lot of software from tape to disc, as well as making back-up copies of the disc software that I have bought. In 90 per cent of cases this involves a lot of hard work getting past the various ploys used by the software houses to protect their products from piracy.

On the whole this is a pretty boring business. At the end of it all the only real satisfaction you get is from knowing that you've cracked a puzzle that must have taken someone a long time to construct!

However, I recently came across a small section of code buried on my *Elite* disc which made all my efforts seem worthwhile.

Having spent a good week deciphering the various uncatalogued loading routines, I happened to look at a hex dump of one download routine, and there, staring me in the face, was the message: 'Does your mother know you do this?'

It's nice to know that someone at Acornsoft has a sense of humour!

J M Millar
Bedford

STR$ PUT STRAIGHT

Sir, Your April issue gave a reply to Mr Powell who was having trouble with the STR$ function, but I think you may have inadvertently misled him.

It's essential that the STR$ function if applied to a number returns the precise number *as a string* otherwise the function is useless. The problem has little to do with floating point hazards.

If the machine is asked to put into a string a number which is longer than 10 digits, it baulks and just returns the rounded number. So PRINT STR$ (4.699999999) returns 4.7, but PRINT STR$(4.69999999) will return the numeric string 4.69999999. There is a huge difference between P.STR$ (a 15 digit number) which will return an exponential format or a rounded figure, and P. "a 15 digit number" which in fact it will do accurately even if put as A$ = "a 15 digit number": P.A$ – this works too. So if we were to write:

A=4.7:A$=STR$(A):P.A$

the display is 4.7. One has to ask what operating system Mr Powell has, and to say that if the machine will *not* do the following bits and pieces then it is faulty.

The whole point about the STR$ function is to put numbers into string form so that one can use the string 'slicing' facility on them. It is impossible to designate, say, the third and fourth digits of an eight digit number without this ability to turn the number into its string form. (It is a pity that hand-books emphasise the string slicing with words instead of numbers, which is where the real utility of the slicing commands lies.)

I can assure Mr Powell that if he types in A$=STR$(4.7):P.A$ that 4.7 will be displayed and that P.LEFT$(A$,1) will display 4, while P.MID$(A$,2,1) will display the decimal point! Below is the test program which your machine should do.

On Run this will display in magenta the digit 6, and eight lines under that in yellow the digit 9, both still numeric strings, and eight lines under that the number 69. On larger numbers you can forget the STR$ function and use the direct form of string – the desired number of any length, in quotes, for example, A$ = "12345678912345678 123456" and one can perform wonders with it and the LEFT$, RIGHT$, and MID$ commands. I hope this helps.

J Frank Hughes
Clwyd

```
10 A=4.699999
20 A$=STR$(A)
30 B$=STR$(VAL(MID$(A$,3,2)))
40 CLS
50 P.TAB(15,8);CHR$133;LEFT$(B$,1)
60 P.TAB(15,16);CHR$131;RIGHT$(B$,1)
70 P.TAB(15,24);CHR$132;VAL(B$)
```

Listing 2. Proves Frank Hughes' point about the STR$ function

UNCOVER A DIAMOND

Sir, Here are some clues to the passwords required for Superior Software's excellent game *Repton:* a) S__een One, b) C_am_le_n, c) Te_r_p_n, d) S_d__i__er, e) G__ko, f) P_t__n, g) S_l_m_n_er, h) I_u__a, i) C_t_l_f_sh, j) O_t_p_s, k) G_a_t C_am, l) T__ K___en.

Also, at certain points in the game a quick flick side to side is necessary to let a boulder drop, then push it to the side before it falls past you and covers a diamond.

At the end, you are told you must finish all the screens from the beginning before you can enter the competition!

On a different subject we have discovered an error message that I've not seen mentioned before – 'RENUMBER space'.

It occurs when the Basic has insufficient space to store pointers, and so on, when it is renumbering.

Stuart Hickinbottom and Carlos Moreno
Stourbridge

KEYBOARD CONVERSION

Sir, In reply to Matthew Burgess' letter (Central Processing, August), there is a keyboard conversion program allowing you to use a joystick on keyboard-only games.

It's called *Joyset 2* from Bud Computers.

S A Oliver
Essex

PHLOOPY HELP AND ADVICE

Sir, Perhaps I can throw some light on the problems Wayne Webb is experiencing with his Phloopy drive (letters, August). I installed a Phloopy interface and ROM in my Beeb, following the instruction in the manual, without any difficulty.

The 'Read Only' error message is produced when trying to write to a Phloopy cartridge that has been hardware protected by breaking off the tab.

Individual files can be software 'write protected' by using the *LOCK command, and attempting to write to such a file will result in the error message 'File Locked'. The file can be unprotected with the command *UNLOCK.

If the 'Read Only' message occurs with the cartridge tab in place, then the problem probably lies with the switch that detects whether or not the tab is in place, when the cartridge is pushed fully into the drive. This switch is fairly crude in construction and it may be that it's is not working properly due to the moving contact being incorrectly bent. This switch can be reached by removing the top half of the Phloopy casing. Care should be taken if the casing is opened as the cartridge door is likely to spring out due to its return spring.

Dave Beecham
Potters Bar

C A Jays from Bedford adds: I too had problems with a Phloopy drive and had the first unit replaced only to have exactly the same trouble – it would not read, format or write a tape.

I eventually found that the operation of the Phloopy was being upset by interference generated by my TV. I now keep the Phloopy and ribbon cable about a minimum of 6in away from the TV set and the system works properly.

I am very satisfied with its performance as a high speed tape reader and so long as the tapes are regularly erased in a bulk eraser there are no problems.

BAR CODE ADDITION

Sir, Those of your readers who have used the *Acorn User* bar code reader for storing product codes with the program called EAN may have found difficulty reading codes that end in a zero.

The following additional line will cure the problem:

5195 If checksum = 10 THEN checksum = 0

Mike Bostock
MEP Technology Manager
Newcastle-upon-Tyne

HELP NEEDED TO ESCAPE

Sir, While I find George Hill's printer driver generator for use with *View* (*AU* June) is excellent and produces facilities which Acornsoft's cannot, I still have some problems.

I am using the Olivetti JP101 printer with *View* (A2.1), and can, with the aid of your program, produce figure 1.

However, I cannot obtain the double height effect properly.

Finally, I wonder if the driver program could be modified to incorporate the commands which take five bytes in length, ie, to take into consideration the JP101's various languages available?

At least for the moment the program out-performs the one by Acornsoft and it's a shame that these minor niggles are sending me right round the bend!

Ron Winson
Berks

```
Underline -  ESC * 0 : ESC +
Double Underline -  ESC * 1 : ESC +
Dotted Underline -  ESC * 1 : ESC +
Double Width -  ESC 3 : ESC 4
Characters, 10 CPI -  ESC ( : ESC 0
Characters, 12 CPI -  ESC = : ESC 0
Characters, 18 CPI -  ESC ) : ESC 0
```

Figure 1. Escape codes produced on the Olivetti JP101

George Hill replies: Your problems with the Olivetti JP101 printer are not your fault, but those of the printer. I tried out my generator on it as a part of the proving program, and found all the problems which you describe. There is no solution, I'm afraid.

On your other point regarding the modification to codes of more than three characters there are two possibilities. Either rewrite the driver to use a smaller table with more bytes per entry, or use more than one highlight code per function. I have neither the time nor inclination to do the former, but an example using method two would be to send ESC * 5 0 2 (the code for 512 dot graphics in plotter mode on the Epson), define 129 as 3 ESC * 5, define 130 as 2 0 2 and send *A*B to perform both one after the other.

ATTRACTIONS OF LEXIS

Sir, Geoff Nairn's article, 'Dial-a-database' in the August issue of *AU*, prompted me to follow up the possible attractions of Lexis, the legal database.

I had previously assumed that the charges would be so high as to deter any but the largest companies, and the £10 per hour quoted seemed so modest that I wondered whether there had been some change of heart by the organisation. On investigation I found there was a minimum charge of £400 per month (VAT extra) and a £400 (minimum) charge for equipment (I realise Geoff may not have known this).

Emlyn Williams
Kent

LETTERS

TOUCHPAD SOLUTION

Sir, I recently bought one of the newly-launched Cumana touchpads complete with a cassette containing 'Pad' and 'Print' programs to drive the pad and give hard copy respectively.

I soon found that there was a problem on machines with the 6502 second processor so I wrote asking if they could give advice on how to overcome it. The snag concerns the addresses at which the picture is stored (I/O versus the 6502) and where it needs to be for printing out.

My letter elicited the all-too-familiar nil-response so, in case anyone else has a similar problem, here is my solution.

In the 'Pad' program change line 1 to HIMEM=&B700 (this pre-supposes that Hi-Basic is resident). Add lines 621 to 623, change lines 625 and 630 and add line 631 as shown below.

The only line changes to the 'PRINT' program are by way of tidying up. Delete line 0 (unnecessary HIMEM address) and use OSCLIs instead of $N and CALL&FFF7.

So far, the programs as amended seem to do what is required of them. I feel sure that more could be done with the touchpad; for instance, labelling of diagrams, etc.

Finally, congratulations on maintaining the high standard of *Acorn User*.

R J Lindsell
Essex

```
621 INPUT"TAPE(T) OR DISC(D) "TD$
622 IF TD$="D" OSCLI"DISC" ELSE
OSCLI"TAPE"
623 IF TD$="D" INPUT"DRIVE NO.
(0-3) ",DR%:OSCLI"DRIVE"+STR$(DR%)

625 HIMEM=&B700:N=&B702:IF O=10
THEN $N="SAVE "+B$+" FFFF3000" ELSE
$N="LOAD "+B$+" FFFF3000"
630 Y%=&B7:X%=&02:CALL&FFF7
631 OSCLI"DRIVE"+STR$(O)
```

Listing 3. How to overcome the 6502 problem when using a touchpad

ACORN USER EXHIBITED

Sir, I would like to make a few comments on the Official *Acorn User* Exhibition that many readers will have attended.

Although Thursday was first and foremost a trade and press day, at 12.45 there was a long queue waiting to get in. This was quite a heart-warming sight – an indication that despite the problems of Acorn and the industry as a whole, users were still prepared to give up a warm summer's day to attend the event.

Once inside the building, however, the value of those crowds turned sharply downwards. The two halls were packed full all afternoon causing great discomfort for organisers, exhibitors and visitors alike. Apart from the obvious safety threat it meant that it was very hard to talk to the exhibitors on an individual basis. There are a number of causes for this highly dangerous congestion.

First, the Barbican exhibition halls have very narrow areas for the stands, have inadequate air-conditioning and give a very cramped impression. *Personal Computer World* has moved its show to Olympia, which is a vastly superior location.

As you have learnt over the past three years, the *AU* exhibition is always well attended, indeed over-attended, and because of this problem entry should only be permitted to ticket holders who purchase tickets in advance, so that the number of visitors could be limited.

Many of the stands were badly laid out and run – not surprising since many exhibitors have had little experience of such events. A comprehensive guide book should be issued well in advance in order to give exhibitors a chance to properly organise their stands.

Many of these problems could possibly have been avoided with proper planning and management.

Thanks must go to *Acorn User* for supporting Acorn users when many other organisations have given up and abandoned their following. I look forward to another event – albeit much improved – next year.

Chris Haine
Warwicks

SEGMENTS MENU ANNOYS

Sir, *Wordwise Plus* has a main text area and a number of segment areas which can hold text or programs. It's annoying that the menu for the segments doesn't include an option for performing search and replacement edits.

Here's a tip on how to call up this function from the segment menu. To invoke the search and replace function you simply type:

:CALL &AC4C

from the menu, then follow the prompts in the normal way.

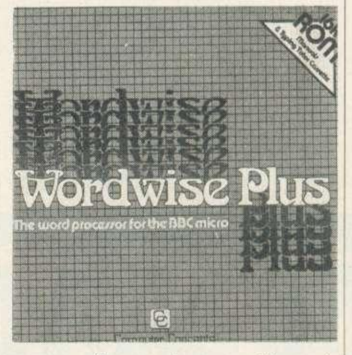
John Stewart
Cambridge

THE PLUS OF WORDWISE

Sir, As a user of Computer Concepts' *Wordwise Plus*, I was delighted to see Patrick Quick's excellent and well-timed review of the package in the August issue of *Acorn User*.

In the very generous space allotted, Patrick could 'only hint at the possibilities' of the programming language that the new chip includes.

Clearly he spent a long time playing with this unnamed language (how about calling it Wordplus?), but I would very much like to reinforce his well-deserved enthusiasm.



The first day that I spent any time with Wordplus I found I was able to write sophisticated and useful programs. This programming language is a real joy to use, and I would like to urge readers to try and use it.

Not only is it a very simple yet versatile and structured language, it is a real delight to be able to write programs that work on text rather than just on numbers and strings.

The possibilities are endless, and I know that many people have already explored them a great deal further than I have.

Yet in that first day I was able to produce, among other things, a jargon-generator, a program for coding and decoding messages, and a version of 'consequences' that can amuse me and be instructive for hours.

Eric Deeson
Birmingham

CENTRAL PROCESSING

For a fast answer to your question, write to Central Processing, Acorn User, 68 Long Acre, London WC2E 9JH

R van den Boorn, The Netherlands
BCPL stands for Basic Combined Programming Language. The April 1983 issue contained a very useful introductory article on BCPL by Stan Froco and this would certainly answer all your questions.

B Bedford, Hythe
I would not recommend the use of any disc drive cleaning kit, as they are likely to do more harm than good. The best housekeeping is to ensure the disc drive is clean by not subjecting it to dusty environments, tobacco smoke and coffee stains! Similarly, treat your discs with the utmost respect – always replace them in their cardboard covers after use, keep them in a proper disc storage box and never leave them in the disc drive when not in use.

B Conway, Upper Norwood
I suggest you contact Oak Computers on (0274) 614167. They can supply you with the necessary leads to enable you to lengthen the minute cable supplied with your second processor.

Certainly, you will find that many ROMs are incompatible with the 6502 second processor but Acornsoft's ROMs are compatible. *Worldwise Plus* will run on the 6502 second processor and a Hi version is also available. If compatibility is important, check with the dealer concerned before parting with your cash!

Bruce McBain, West Sussex
The *filename command (where filename is the name of the program) is used to load and run a machine code program that had been saved previously with the *SAVE command. This technique cannot be used readily to load and run Basic program: to do this use CHAIN "filename".

Michael Smith, Hove
You are quite correct in saying that the string escape character ¦ can be used as an operating system command to emulate the Basic REM statement. It is particularly useful in !BOOT files on discs. For example:

*¦ This is the !BOOT file

used when *BUILDing a !BOOT file would be ignored by the operating system when the disc is booted.

Trevor Rymell, Singapore
The error message 'Bad name' is generated by the filing system when you use a filename containing more that the permissible number of characters. For example, the Cassette Filing System (CFS) allows the use of 10 characters for a filename. If you were to use more than this number a 'Bad name' error would be generated.

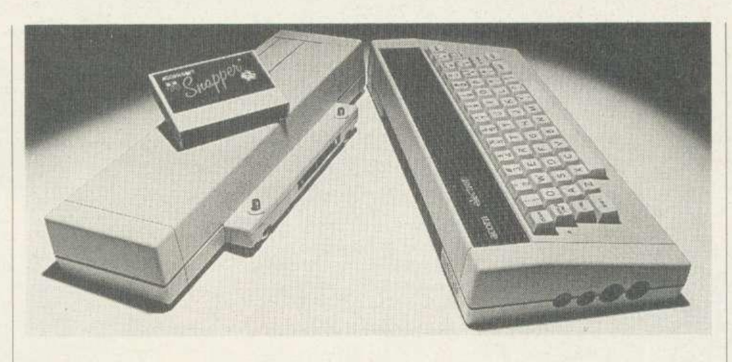
DEAR KITTY

For simple answers, send your queries or questions to Kitty

Each month on the front page of *Acorn User* it is stated that the contents are for BBC micro, Electron and Atom users. As an Electron owner I am concerned that in fact the articles do not really apply to my micro. Apart from Atom Forum everything else seems to be for the BBC micro only.

I have a similar problem when it comes to obtaining software and hardware for the Electron. For example, where can I get a suitable sideways ROM board or some sideways RAM?

Michael Black
Brixton



Acorn User *certainly does cater for the Electron. All that you need to do is cast an eye over the index on the first yellow listings page. For example, in the October issue we carried 29 listings, and 26 of these would work on a straight Electron while the other three required the Plus 1 add-on. In fact the main feature items printed in* Acorn User *are, in most instances, chosen because they will work on both.*

In general, most programs written for the BBC micro will run on the Electron so long as they are not specific to the Beeb hardware and are not dependent on its teletext mode, mode 7.

Software and hardware support is readily available for the Electron. Acornsoft, for example, has most of its titles on offer for the Electron. Many of the languages and wordprocessors on ROM for the BBC micro, eg, View, *Logo and Pascal, are obtainable in cartridge for the Electron with Plus 1.*

Slogger Software produces the Rombox, which is compatible with the Plus 1 and Plus 3, and will hold ROM-based software for the Electron. Slogger itself markets a range of firmware (that's software in ROM) for the Electron.

Advanced Computer Products has recently launched a whole range of add-ons for the Electron Plus 1 and Plus 3 systems, including ROM adaptors, Advanced Disc Filing Systems and sideways RAM. The latter is in the form of a cartridge and plugs into the Plus 1. The company is planning future projects for the Electron including a 6502 second processor interface.

Cumana produces a disc interface for the Electron which plugs into the Plus 1 and also includes a real time clock plus a spare sideways ROM socket. Solidisk is advertising a disc interface for the Electron.

So, as you can see, Acorn User *certainly is supporiting the Electron, and there is a lot of hardware and software around for it when you know where to look.*

Watford Electronics

Dept. AU, Jessa House, 250 Lower High Street, WATFORD, ENGLAND
Tel: Watford (0923) 37774/40588 Telex: 8956095 WATFRD
Credit Card Orders TEL. ACCESS (0923) 50234 VISA (0923) 33383 (24 Hours)



All Watford products now available in Holland from: First Ludonics International, 2400 AJ Alphen aan den Ri jn, Nedherlands. Tel: 01720 72580



BBC Micro 'B' Only: £289

BBC B PLUS	£389
BBC B with Watford DFS	£339
BBC B with Acorn DFS	£335
BBC B with Watford DDFS	£355
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BBC B + DFS + ECONET	£395
BBC B + DFS + 32K RAM Card	£397
BBC B + 13 ROM Board fitted	£322
BBC B + 32K RAM + 13 ROM Board	£379
BBC B + DFS + 32K RAM + 13 ROM Board all fitted	£429

ECONET ACCESSORIES

ECONET UPGRADE KIT	£52
Econet STARTER KIT	£85
Clock Boxes	£39
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10 Station Lead	£24
Advance Econet User Guide	£8.50

6502 Acorn 2nd Processor package	£175
Z80 Acorn 2nd Processor package	£339

TORCH Z80 Card + Perfect Software	£249
TORCH Z80 Card+Soft. + Disc Pack	£499
TORCH GRADUATE Z80 System	£725

Acorn Bitstick	£325
Acorn IEEE Interface Complete	£280
Acorn Teletext + Interface	£195

(Securicor carriage on Micros £7)

Dust Cover for BBC Micro

£3.50

VARIOUS PRINTERS

- EPSON RX100 £342
- EPSON FX80+ Printer £289
- EPSON FX100+ Printer £429
- EPSON JX-80 Full Colour Dot Matrix Printer. Prints in 7 Colours. Upto 160 cps £499
- EPSON Paper Roll Holder £17
- FX80 tractor attachment £37
- SEIKOSHA GP50A & GP50S £69
- Centronics Printer Cable to interface all the above Printers to BBC £6

(Securicor carriage charge on printers £7)

EPSON LX-80 PRINTER

EPSON's new Low cost High performance printer. Print speed 100 cps, NLQ mode 22 cps. 9 needle print head. Full FX-80 capability is supported with downloadable fonts. Friction feed is supplied as standard, with tractor feed and an attractive auto sheet feeder as optional extra. NLQ Mode and current typeface selectable from front panel.

Price: **£220** (carr £6)
Tractor Feed Attachment **£20**
Single Sheet Feeder **£49**
Spare Ribbons **£4**

CENTRONICS GLP (NLQ) Printer

A major price break-through in NLQ Printers from Watford

At last, a full feature Epson compatible NLQ printer at a price that everyone can afford. Due to Watford's bulk purchasing power and low margins we can now offer this incredible printer deal direct from the manufacturers to our customers.

The Centronics GLP features a near letter quality (NLQ) mode using a 23 by 18 dot matrix for each NLQ character (this is the same as is used by the very popular Kaga Taxan printers).

Single, double and quadruple density graphics modes as well as four character widths and super/sub script printing are also supported, along with many other facilities normally found on printers costing twice as much.

Although the GLP is a very compact printer, it can handle paper up to 10 inches wide. Friction feed is supplied as standard with a low cost tractor feed available as an optional extra.

The GLP is a bidirectional logic seeking printer with a 9 needle print head and features a long life ribbon cartridge. The GLP is supplied with a Centronics parallel interface and comes complete with a ready fitted alternate NLQ font ROM containing a different and more pleasing type face (other font ROMs available, including Gothic, Courier, Italic, Copper Plate, Script, Double, Bold etc.)

Send an SAE for further details of the GLP NLQ Designer and extra font ROMs.

Christmas Offer **£99** (carr £5)
Tractor Feed Attachment **£15**

BROTHER HR-15

Brother HR15 is a high-quality daisy-wheel ideal for a budget printer for serious use. Notable features of this printer include a 3k buffer, 18cps (max), bi-directional proportional spacing, Centronics interface standard, (RS232 optional), optional Sheet Feeder and Keyboard.

ONLY **£299** (carr. £7)

Single Sheet Feeder	£185
Electronic KEYBOARD	£135
TRACTOR FEED Attachment	£84

RIBBON CARTRIDGES:
Fabric **£3.75**; Carbon **£3.75**; Multistrike **£6**

DAISYWHEELS (various typefaces) **£18**

We are now offering at no extra cost ON-SITE 12 months maintenance on all HR15 Printers purchased from us.
W.E. GIVES YOU A GREAT DEAL

Listing Paper (Perforated)

1,000 Sheets 9½" Fanfold Paper	£7
2,000 Sheets 9½" Fanfold Paper	£13
1,000 Sheets 15" Fanfold Paper	£9
Teleprinter Roll (Econo paper)	£4

Carriage on 1,000 Sheets £1.50

PRINTER LABELS (On continuous fanfold backing sheet)

1,000 90×36mm (Single Row)	£5.00
1,000 90×36mm (Twin Row)	£4.90
1,000 90×49mm (Twin Row)	£7.50
1,000 102×36mm (Twin Row)	£6.25

Carriage on 1,000 Labels £1.00

KAGA KP810 NLQ PRINTER

This excellent printer is fully Epson FX-80 compatible and offers superb NLQ printing. Over the last year, we have sold more of these printers than any other make. Write in for further details of this printer.

Special Offer: ONLY **£229** (£7 carr.)

Kaga RS232 Interface	£49
Kaga RS232 Interface + 2K Buffer	£69
Kaga RS232 Interface + 16K Buffer	£95

KAGA KP910 Printer

Similar to the KP810 but with 17" carriage for wide print. Gives 156 columns of normal print or 256 columns in condensed mode. Ideal for printing out spreadsheets.

ONLY **£339** (£7 carr.)

PRINTER LEAD

Centronics lead to connect BBC micro to EPSON, KAGA, SEIKOSHA, NEC, STAR, JUKI, BROTHER, SHINWA etc. printers.

Standard length (4 feet long)	£6
Extra long (6 feet long)	£8

We can supply leads to any required length.

RS232 Cables available in any length and any combination. Please telephone for your requirement.

PRINTER RIBBONS & VARIOUS DUST COVERS

Type	Ribbons	Dust Covers
FX100	£10.00	£5.25
FX80/MX80	£4.50	£4.95
RX80	£4.50	£4.50
GP80	£4.50	–
GP100	£4.95	£3.95
GP250	£5.95	£3.95
KAGA KP810	£5.95	£4.75
CANON PW1080	£5.95	£4.75
MICROVITEC MONITORS	–	£5.50

Our attractive Dust Covers are manufactured from translucent PVC. The seams are stitched and edges are taped to prevent splitting due to continuous use.

SEIKOSHA SP-1000

This new attractively finished dot matrix printer features **Near Letter Quality** mode and is unsurpassed at the price. Provides high quality printout for word-processing, whilst retaining a fast mode (100 CPS) for draft copies. Other features include a variety of character sets, underlining, bold print and double strike, bi-directional logic seek, automatic paper loading, variable paper width etc. Friction Feed; Tractor feed optional extra. SP1000 makes available the facilities of much more sophisticated printers at a very reasonable price.

Introductory price: **£189** (carr £6)

SPECIAL OFFER
EPSON FX80
ONLY **£289**

RX & FX PRINTER INTERFACES

Epson interfaces fit inside the printer to allow connection using techniques other than Centronics.

RS232	£25	RS232 + 2K Buffer	£55
IEEE 488	£62		



We stock a range of monitors to suit all needs. Choice of a monitor is a matter of personal taste so we recommend that whenever possible, you ask for a demonstration at our shop. All Monitors are supplied complete with connecting lead.

MICROVITEC 14"

- 1431 – Medium resolution as used on the BBC television computer programme £179
- 1451 – High resolution, suitable for word processing in mode 0 .... £229
- 1441 – High res, exceeds the capabilities of the BBC micro £385
- 1431AP RGB + PAL and AUDIO £199
- 1451AP RGB + PAL and AUDIO £269
- Dust Cover for Microvitecs £5.50

KAGA/TAXAN 12"

- KAGA KX1201G Hi-res Green Monitor £90
- KAGA KX1202G Ultra-Hi-Res Green Monitor £105
- KAGA KX1203A Ultra-Hi-Res Amber Monitor £105
- KAGA Vision 2, Hi-Res, RGB Colour Monitor £225
- KAGA Vision 3, Ultra Hi-Res, RGB Monitor £310

FIDELITY COLOUR MONITOR

- Medium Resolution, attractively finished, 14" RGB and Composite VIDEO/AUDIO Input. Has a detachable anti-glare screen.

Introductory Offer: **£169**

ZENITH

12" high resolution monochrome monitor. Ideal for word processing as its green or amber screen is very restful to read. The high resolution makes it good for games too – you can really see the detail that has been put into the graphics.

Zenith Green Hi-res £70
Zenith Amber Hi-res £72

LEADS

BNC Lead for Zenith or Philips £3
RGB lead for KAGA £3

N.B. Carriage on Monitors **£7** (securicor)



CREDIT CARDS
24 HOUR HOT LINES
ACCESS 0923 50234
VISA 0923 33383



This Light Pen for the BBC micro is packaged in a neat pen shape with built in switch. Supplied complete with our sophisticated Pen-Pal software on cassette.

Only **£23**

(For software on disc please add £2)

4 COLOUR PLOTTER PRINTER

SAKATA SCP-800 printer/plotter facilitates plotting & printing in 4 colours on paper upto A4 size, using easily replaced pens. In text mode it prints upto 12 CPS. Max 160 Char. per line. In graphics mode it offers full plotting facilities incl. drawing, moving, scaling of text, rotation & drawing of axes. (Write for a sample printout).

Only £155

Set of 4 SPARE PENS only **£4.50**

SPECIAL OFFER

HITACHI EPROMs for Sideways ROMs

2764-250nS £2
27128-250nS £3

RAMs (Low power) for ATPL, WATFORD, etc., Sideways ROM Boards

6264LP (8K) £4
2 × 6264LD (16K) £7.50

PRINTER SHARERS

Connects
3 BBC Micros to 1 Printer **£65**
6 BBC Micros to 1 Printer **£129**

BBC MICRO WORD-PROCESSING PACKAGE

A complete word-processing package (which can be heavily modified to your requirements, maintaining the large discount). We supply everything you need to get a BBC micro running as a word-processor. Please call in for a demonstration.

EXAMPLE PACKAGE

BBC Model B, Watford Electronics' DFS upgrade, WORDWISE ROM, Twin 800k Mitsubishi drives in beige, Zenith 12" Hi-resolution monitor (Green or Amber), Brother HR15 daisywheel printer. Gemini software: BEEBCALC spreadsheet, analysis and DATABASE software on disc. 10 × 3M disc, 500 sheets fan-fold paper, 4 way mains trailing socket, manuals, all leads and BBC carrying case.

NEW LOW PRICE

Only £999

THE EPSON RX/FX/KAGA PRINTER COMMANDS REVEALED

So you bought yourself a new printer, because the salesman in the shop showed you how clever it is and impressed you with all sorts of printouts to show its capabilities – he may even have offered you a special price.

However, now that you have got it home and connected it to your BBC microcomputer, you are wondering how to make it perform these magical tasks. The manual seems to give no clues, and when you type in the example programs, the computer throws the LPRINT statements back in your face.

Now what do you do, when this £400 piece of high technology refuses even to move its head, and you have stayed up until 2 in the morning with copious supplies of coffee, desperately trying to print something out. Once again, Watford Electronics comes to your help with our new book entitled 'THE EPSON FX/KAGA PRINTER COMMANDS REVEALED'.

This book describes in plain, easy to understand English how to use your printer (Kaga KP810, Canon PW1080A, or any other Epson FX-80 compatible printer) with the BBC micro, both from Basic and your Wordwise wordprocessor.

It describes in detail how to obtain the maximum in graphics capability from your printer and includes full indexes allowing you to cross index the numerous commands. Every command is explained in detail, with an accompanying BBC Basic program and an example of its use from Wordwise.

This book is superb value at only
£5.95 (Book – No VAT)

Nightingale Mod

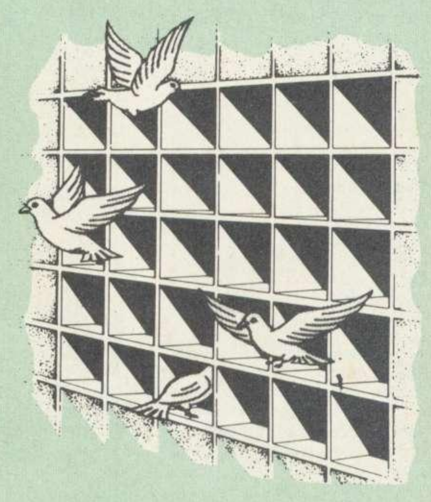
SPECIAL PRICE to our Customers

£119

(Price includes COMMSTAR ROM & comprehensive manuals)

Nightingale Modem without software	**Only £99**
COMMSTAR ROM package only (P&P on modem £2.00)	**£29**
Auto Dial/Auto Answer Board	**£48**
Auto Dial Utilities Disc	**£9.50**
OBBS Bulletin Software	**£20.00**

DATABASE MANAGEMENT SYSTEMS



DISCDATA

Discdata is an entirely disc based database handling system. It is extremely easy to use through its comprehensive menu system. The simplicity is such that we do not feel the need to provide explanation on use in the written guidance supplied with the program. The first-time database user will rapidly become familiar with this package designed throughout to be simple and obvious.

On disc at **Only £17**

(Please specify 40 or 80 track when ordering)
(Please write in for technical specifications)

FILE-PLUS

File-Plus is a powerful database for the BBC micro with many advanced features. Largely menu driven, File-Plus is provided on a 16k ROM with some extra utilities on disc. Features included are detailed below:

- Flexible full screen form layout.
- Built in File Query Language (FQL).
- Printer Output.
- Arithmetic operations in FQL.
- Looping in FQL.
- Number range of +– 9999999999.9999.
- File linking allows files over different drives.
- Multiple forms allow selection of displayed data.

Only £32

(Please specify 40T or 80T disc

DATAGEM

Gemini's 24K ROM based DATABASE Management System

Special Offer: **£67**

Continued →

The ULTIMATE DFSs for the BBC MICRO

WATFORD TOPS THE DFS CHART

Watford's Ultimate DFS has scored highest points in ACORN USER's unbiased DFS's Review of July 1985.
In concluding, the reviewer writes "It must be said that Watford's DFS certainly offers a comprehensive range of facilities at a very attractive price". (Please write in for comprehensive details.)
To celebrate the occasion, we are offering Watford's complete Disc Interface Kit at only £59 and the Double Density Unit at £66.

Just compare the features:

Features	Acorn 1.20	Watford Single Density	Watford Double Density
Max nos. of files per disc side	31	62	62
Max disc capacity	800k	800k	1440k
Tube compatible	Yes	Yes	Yes
Built-in Editor	No	Yes	Yes
Built-in Formatter	No	Yes	Yes
Built-in Verifier	No	Yes	Yes
MRUN a file	No	Yes	Yes
MLOAD a file	No	Yes	Yes
Extended RENAME	No	Yes	Yes
Selective COPY	No	Yes	Yes
Default file name	No	Yes	Yes
Disc space distribution	No	Yes	Yes
40/80 Software Switchable	No	Yes	Yes
Wide catalogue	No	Yes	Yes
Close open files	No	Yes	Yes
Improved OPENOUT	No	Yes	Yes
Copy between densities	N/A	N/A	Yes
OSWORD &7F	Yes	Yes	Yes
Full entry point compatibility	Yes	Yes	Yes
Retain information over a break	1.20 partial	1.43 Yes	1.53 Yes
Games compatibility	Yes	Yes	Most
Econet file server	Yes	Yes	Yes
Econet station	Yes	Yes	Yes
Full wildcard facilities	No	Yes	Yes

WATFORD's & ACORN's SINGLE DENSITY DFS

Watford's popular and widely acclaimed DFS has now been available for two years, and has gained a large following amongst serious users of the BBC Micro. Owners of Acorn or any other standard DFS can upgrade to our "Ultimate" DFS merely by replacing their DFS ROM. See below for this upgrade.

PRICES

- *Complete Disc Interface Kit incl. DFS ROM & fitting instructions* **£59**
- *Acorn's DFS Kit complete* **£60**
- *DFS Manual (Comprehensive)* *(no VAT)* **£6.95**
(P.S. Our comprehensive DFS Manual covers both Acorn & Watford DFSs)
- *Watford's sophisticated DFS ROM only* **£16**
- *We will exchange your existing DFS ROM for Watford's Ultimate DFS ROM for only* **£12**
- *Watford's DFS is exclusively available from Watford Electronics. Every ROM carries a special label with our LOGO and serial number.*

WATFORD's DOUBLE DENSITY DFS INTERFACE

The DDFS from Watford Electronics represents a new standard in DFSs for the BBC micro. This is a double density version of our popular single density DFS, and combines all the features of this powerful DFS with the advantages of a system that gives 80% more storage per disc in double density mode. P.S. – Please note that not all DDFSs are capable of providing either the full 80% storage increase, or of allowing a file the full size of the disc – Ours allows both of these!

The typical piece of games software these days is provided upon a protected disc. In order to work on any double density system (including the others on the market) a protected piece of software needs to make calls through the OSWORD &7F routines. To ensure compatibility, the Watford DDFS features probably the most comprehensive and powerful 8271 emulation ever written for a double density system.

PRICES

- *Complete DDFS Kit incl. fitting instructions* **£60**
- *DDFS Manual* *(no VAT)* **£6.95**
- *We will exchange your existing Single Density DFS Kit for our DDFS Unit at* **£35**

The Watford Electronics DDFS for the BBC B Plus

Watford Electronics was the first company to produce a serious alternative Disc Filing System (DFS) for the standard BBC micro. Since then, we have been refining and advancing this sophisticated product right up to today.

Now WE'VE DONE IT AGAIN; Watford proudly presents the Double Density Disc filing system for the BBC B+, with all the advantages of the advanced Watford DDFS available on the new BBC B+ DDFS.

Acting as a powerful alternative DFS to Acorn's '1770 DFS' supplied with the BBC+, this superb addition to any BBC+ greatly enhances it's performance with a simple fitting operation. Just compare the features below with those offered by the Standard DFS:

- SINGLE or DOUBLE DENSITY operation. Double Density operation gives 80% more storage.

- Automatic detection of density for operations.
- 31 or 62 file catalogue with automatic catalogue size detection.
- Files can be up to FULL size of disc (360k) due to extension bit.
- Multiple file rename with FULL wildcards (even more powerful than those offered by the Standard DFS on it's *COPY operation!)
- *COPY with FULL wildcards; not the normal Acorn ones.
- Selective *COPY operation, with FULL wildcards.
- *COPY, *MOVE, *BACKUP, etc, over densities, 40/80.
- Status Display of open files (handle, full filename, pointer, extent and access type).
- Close all open files with a single * command.
- Built in single and double density verify routine.
- Built in single and double density sector editor.
- Read and WRITE in 40 track discs on 80 track drives.
- 40/80 switching drive independent.
- 40/80 switching automatically performed if needed.
- Built in formatter allows for mixing of density, catalogue size, 40/80 track and 40/80 switching.
- MLOAD and MRUN commands help run tape files from disc.
- Econet Level II file server capability Econet work station capability.
- Extremely powerful 8271 emulation for loading games, etc.
- Comprehensive OSWORD &7F emulation.
- Default filename system, useful for program development.
- Full width wide catalogue display in 80 column modes.
- Extended *LIB specifications.
- Optional preceding letter on * commands to avoid ROM clashes.
- List of sector gaps unused on disc.
- Full retention of open files over Break.
- Full retention of drive settings over Break.
- Full retention density settings over Break.
- Extended read filenames (via extended OSGBPB functions).
- Automatic sector skewing during formatting.
- Assumes last density for next disc access for speed.
- Read drive of last *RUN / *LOAD operation.
- Load ambiguous filename for convenience.
- Improved space allocation for OPENOUT.
- Invalid execution address (&FFFFFFFF) in *RUN causes *EXEC of file.
- Extended *HELP implementation shows syntax of individual commands.
- Extended error checking on operations.
- Catalogue shows number of files in catalogue.
- 40/80 stepping state displayed in catalogue.
- Catalogue shows catalogue size.
- Catalogue shows number of tracks.
- Default filename displayed in catalogue.

As you can see from the above information, Watford's DDFS for the BBC+ is far more sophisticated and well thought out than the standard. Take any disc produced by any Watford DFS from the standard BBC and catalogue straight off with no problems.

Unlike the Acorn 'ADFS', our DDFS+ system is just as easy to use as the standard DFSs, with no new complex concepts to have to learn. The features within our DFSs have been constantly enhanced over a period of three years during the time that they have been released; significant attention has been paid to feedback from our customers so that the features offered are carefully honed to the requirements of hobbyists and serious programmers alike.

The Watford DDFS+ is supplied with a comprehensive DDFS manual that explains the basics of disc drives, DFSs, etc. Priced at only £35 including the manual, the Watford DDFS+ is surely one of THE best buys you could make for your BBC B+!

Join the leaders in BBC peripherals; join Watford Electronics – committed to supporting the BBC micro.

BBC B+ DDFS **£35**
(Price includes comprehensive manual)

Quality Disc Drives from Watford Electronics

To help you decide which drive is the most suitable for your needs (and your pocket!), we have produced the table below.

The first capacity given in the first column indicates the single density capacity. The double density storage capacity is second one, (that within the brackets). All disc Drive type numbers start with the prefix "C".

The tinting on some of the boxes is used to indicate which Drives are 40 track and which are 80 track. The 40 track ones are manufactured by EPSON, the world famous Japanese company, (non-tinted boxes). The 80 track drives are famous MITSUBISHI drives (tinted boxes).

With two prices in a box (e.g. £295/£299), the first price is for the standard drive and the second for the same unit in switchable type. Users of either of the two Watford DFSs will not need switchable drives as their DFS will provide software switching for them. Users of Acorn's DFS will find that they need to pay the extra for switchable drives if they wish to use 40 track discs in an 80 track drive.

The drives we supply are fast (3ms track to track, 15ms settle), quiet and have a low power consumption (average well under 1 amp). Extensive experience of the usage of disc drives suggests that the MITSUBISHI and EPSON drives currently represent about the best in terms of speed, reliability and overall "elegance" available for the BBC Micro.

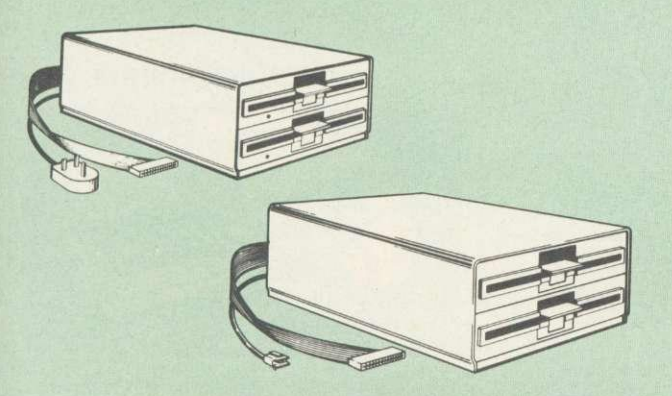
Various other "manufacturers" of disc drives for the BBC micro (more accurately, "packagers" label other manufacturers drives with their own name). We buy the high quality Epson and Mitsubishi drives in large quantities directly from the manufacturers, package them and sell them at "dealer" prices direct to the public.

Names you can trust, at prices you can afford!

If you look around the popular BBC micro press, you will find that the prices we quote for the top quality, new slimline disc drives are, virtually without exception, some of the best around. These prices, coupled with the backup of one of the country's largest distributors of BBC peripherals provides a superb deal.

Unless you anticipate using dual drives in a fully expanded BBC system for long periods of time with little ventilation, then we suggest that our range of "CL" disc drives without the PSU (Power Supply Unit) would be quite adequate: extensive tests within our workshops have confirmed this. All drives are supplied complete with a SPECIAL UTILITIES Disc, Cables and Plugs. The Drives with power supply have a mains moulded plug for safety purposes. (Ideal for Schools & Colleges. All single disc drives with power supply, (i.e. CS100, CS200 & CS400S) are supplied in a twin case with twin data cable for later inclusion of a second drive). At Watford we anticipate your needs of tomorrow not just today!

All disc drives advertised here will operate in double density mode with the appropriate interface and software.



Capacity	Drives without P.S.U.		Drives with P.S.U.	
	Single	Twin	Single	Twin
100K (180K)	CLS100 £76		CS100 £99	
200K (360K)	CLS 200 £76	CLD200 £145	CS 200 £99	CD200 £145
400K (720K)	CLS 400 £78 / £79 CLS400S	CLD 400 £145	CS 400 £78 / £79 CS 400S	CD400 £145
800K (1.44M)		CLD800 £158 / £159 CLD 800S		CD 800 £158 / £159 CD 800S
Securicor carriage on Disc Drives £5				

Prefix C = Cased Drive
L = Less PSU
S = Single
D = Double

Suffix S = 40/80 Switchable

e.g. CLS400S = Cased drive, Less power supply unit, Single 400K, Switchable (40/80 track).

MYSTERIES OF DISC DRIVES & DFS REVEALED

Are you tired of faulty cassettes, and lengthy loading times? Do you want to upgrade your BBC micro to take discs but you get tied up in the plethora of jargon surrounding the choice and use of these systems.

For instance, what is the difference between single and double density formats, how can you use a 40 track disc on an 80 track disc drive? What is the difference between a DFS and disc interface kit? Should you acquire a single Disc drive or twin? What does 48 TPI and 96 TPI discs mean? These are just a few of the questions you may have asked yourself and never found the answer or maybe you have yet to encounter these questions.

Now the mystery of buying a suitable interface and disc drive for your BBC micro is revealed in Watford's new book entitled 'MYSTERIES of DISC DRIVES & DFS REVEALED'. It describes in fine detail, yet remaining very readable to the beginner, how disc drives operate, the type of interfaces available, which type of discs to use on a disc drive and how data is stored on the discs.

£5.95 (Book No VAT)

3M – DISKETTES

Top quality 3M – SCOTCH Diskettes from Watford Electronics (Your 3M Appointed Distributors). All our discs carry a lifetime warranty. These discs are quiet in operation and insert positively with their reinforced hub rings. Boxes of 10 supplied complete with self stick disc labels and write protect tabs.

- *10 × 5¼" S/S D/D 40 Track Diskettes* **£13**
- *10 × 5¼" D/S D/D 40 Track Diskettes* **£18**
- *10 × 5¼" S/S D/D 80 Track Diskettes* **£22**
- *10 × 5¼" D/S D/D 80 Track Diskettes* **£24**

- *10 × 3" S/S D/D 40/80 track Discs* **£37**
- *10 × 3" D/D D/D 40/80 track Discs* **£45**

Buy 2 packs of any of the above Diskettes & qualify for a FREE Egon Ronay's '"JUST A BITE" Guide.

TOP QUALITY 5¼" DISKETTES

To complement the range of quality discs and disc drives that WE already sell, WE are now supplying some special offer packs of 10 high quality discs. Each Disc has a reinforced hub ring and carries a lifetime guarantee. These are supplied packaged in an attractive plastic library disc box to protect them from damage. We strongly recommend these Discs.

DON'T SETTLE FOR LESS, BUY THE BEST

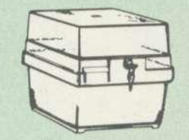
- *10 ×* **M4** *S-S D/D 40 Track Discs* **£11**
- *10 ×* **M5** *D/S D/D 40 Track Discs* **£14**
- *10 ×* **M7** *D/S D/D 80 Track Discs* **£19**

DISC ALBUMS

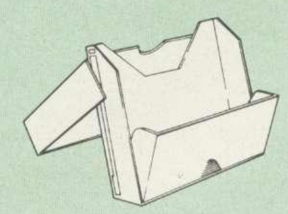
Attractively finished in beige leather-look vinyl, these conveniently store upto 20 Discs. Each Disc can easily be seen through the clear view pockets. **£4**

LOCKABLE DISC STORAGE UNITS

Strong plastic case that afford real protection to your discs. The smoked top locks down. Dividers and adhesive title strips are supplied for efficient filing of discs.



M35 - holds upto 40 discs **£10**
M85 – holds upto 95 discs **£12**



PLASTIC LIBRARY CASES

FOR 5¼" DISC STORAGE holds 10 Discs. **£1.80**

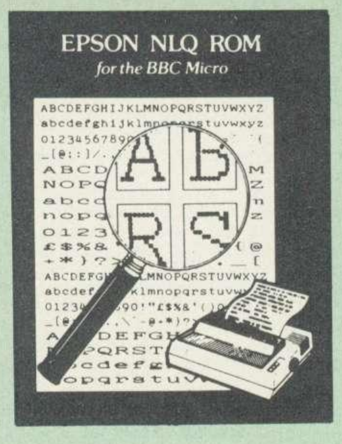
FLOPPY HEAD CLEANER KIT

The heads in floppy drives are precision made and very sensitive to dirt. The use of a cleaner Kit is a sensible precaution against losing valuable data. It is recommended to clean the drive head once a week. It is very simple to use. **£8**

DUST COVERS (For our Disc Drives)

Single (without PSU) **£3.20** Twin (without PSU) **£3.85**
Single (with PSU) **£3.25** Twin (with PSU) **£3.90**





Impress your friends and business colleagues with the quality of your letters and printed material with Watford's very simple to use EPSON NLQ! (Near Letter Quality) ROM. Suitable for FX80, RX80, RX80F/T, FX100.

Look at the features:
- Simply type *NLQ80/100 and a single VDU code to use NLQ print.
- NLQ is then available without any modifications from BASIC, WORDWISE, VIEW (with NLQ DRIVER) or virtually any other program or language.
- Single codes select PROPORTIONAL type (yes even on the RX80); ENLARGED type; UNDERLINED type. These features can be used seperately or in any combination.
- Full UK character set; Standard 'pica size'; Proportional spacing; Enlarged; Underlined; Normal type.

The NLQ ROM is supplied complete with comprehensive manual.

P.S. NLQ ROM is compatible with the Torch Z80 system and can be used from within the Perfect Writer software.

Only: £22

VIEW PRINTER DRIVER for NLQ ROM

This specially written printer driver has been designed to allow View access to the full features of our NLQ ROM.
A must for all VIEW and NLQ ROM users.

£7.00

THE NLQ DESIGNER

The Kaga Taxan KP810 and KP910 are two superb printers, as our many thousands of satisfied customers would surely attest to. One of it's particularly strong points is the NLQ option that it offers; perhaps one of the more weaker points is the effort required to design your own custom NLQ font.

Well the solution is here NOW in the shape of Watford's NLQ DESIGNER ROM! This powerful piece of software allows easy design and entry of a full NLQ font, with further fonts recallable from disc. Once a font has been programmed with the versatile NLQ DESIGNER, it can be saved to disc, downloaded to your Kaga (or Canon) printer, or even programmed into an EPROM (given the appropriate hardware) and then plugged directly into your printer so that it is available immediately when you turn it on. Downloadable Fonts require 6264 RAM chip fitted.

A 40/80 track format disc containing 3 example fonts is included in the package.

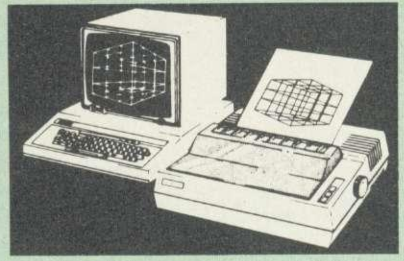
(P.S. This ROM is not suitable for Epson printers as they don't normally have NLQ ability. Keep reading our adverts though – work is in development!)

NLQ DESIGNER & FONT DISC **£25**

INDIVIDUAL Preprogrammed FONT ROMS
£15

(Please write in for further details on both the NLQ DESIGNER and the individual font ROMs available.)
Now available . . .
Centronics GLP printer, additional font ROMs.
Price **£15**
(Please write in for full details).

DUMPOUT 3



A highly sophisticated screen dump ROM. This has to be the most flexible and powerful screen dump ROM yet produced for the BBC micro. It will put on paper anything you see on the screen, including all Mode 7 facilities etc. We have to admit that there is one facility that we cannot replicate – if anyone can supply flashing ink we would like to know!
The ROM also provides window setting utilities and two new OSWORD calls that allow mode 7 graphics pixels to be read and plotted using the standard graphic co-ordinate system. The latest version includes a graphic dump trigger for dumping screens from games whilst they are running.
Two commands are used to operate the dump routines:
*GIMAGE – This provides a full graphics dump of any graphics mode, plus modes 7 and '8'. There are many optional parameters but you need only specify the parameters you wish to change.

Features available include:
- Vertical and horizontal scaling through all the graphic modes and mode 7
- Rotation of the image produced through 90, 180 and 270 degrees
- Left hand indentation setting
- Screen dump window definition
- Colour grey scaling
- Two tone fast dump
- Special colour mask
- Mode 7 contrast expansion
- Mode 7 contiguous dump
- Key triggered dumps
- User port switched dumps

What does the independent press say!

Practical Electronics, May 1985
"The Dump Out 3 ROM from Watford Electronics represents one of the most sophisticated types of printer dump utilities available for the BBC Micro . . .".

"an extremely sophisticated and powerful dump utility".

"VERDICT – Dump Out 3 ROM has all the facilities which you are ever likely to need for producing printer dumps. The facilities available work extremely well and if printer dumps are something which you require, then this ROM can be recommended to help you to get the best out of your dot matrix printer".

The Micro User Feb. 1985.
"Well, here is that winner"!

"provide(s) some rather sophisticated screen dumps. Producing high resolution paper copies of graphic screens in any (graphics) mode will be the major reason for buying this ROM, and this is where Dump Out 3 performs PAR EXCELLENCE". (Our capitals for their italics.)

"The versatility of *GIMAGE (the graphics dump command) when using these parameters is amazing. Pictures of almost any size, shape, contrast or distortion may be produced without the need for a reducing photocopier or trick photography".

"Without reservation I wholeheartedly recommend the Dump Out 3 ROM as the ultimate screen dump facility for the BBC micro. It is easy to use yet highly versatile, and caters for all BBC screen modes in multitone high resolution printing. Whole, partial, rotated and scaled screens may be dumped to almost any BBC compatible dot matrix printer (see our list at the end of this advert). At £24 it must represent excellent value for money and surely cannot be beaten".

Designed for use with the following printers: CP80, GP80/100/250, CANNON, STAR, KAGA/TAXAN, NEC, SHINWA CP80, GEMINI, EPSON MX/RX/FX, LPVII, NEC PC8023, DMP100/200/400, etc. etc.
Price including comprehensive manual

£24

VIEW

VIEW WORDPROCESSOR 2.1 .... **£46**

VIEW 3.0 ROM

This latest version features automatic relocation with a 6502 second processor and takes full advantage of any shadow memory fitted. BBC B Plus compatible. Supplied complete with Printer Driver Generator tape.

Price: Only **£60**

HI-VIEW

A special version of VIEW designed for use with 6502 2nd Processor. Available on disc, it offers 47K of text memory.

£49

VIEWSHEET (Acornsoft) £49

VIEWSTORE £52

Watford's own Sophisticated VIEW PRINTER DRIVER for Epson FX80 & KAGA KP

Only £10

VIEW DRIVERS FOR JUKI & BROTHER PRINTERS

Only £10

VIEW/VIEW SHEET PRINTER DRIVER for SILVER REED
(Officially approved by Silver Reed)

Only: £10

BEEB PRINTER ROM



This utility ROM is designed to simplify using all the facilities of your printer. It has many facilities:

★ Selection of printer modes such as underline, font and size is by 'Single Key' operations.

★ From Wordwise, a single number following OC will select a mode rather than a long and incomprehensible string of control codes. This makes using your printer with Wordwise much more convenient.

★ When using Basic (or other languages) you can have control over the formatting of the output to the printer in the style of a wordprocessor. You can define page top, bottom and side margins etc. with intelligent page skip for binders an option. All supported printers will now respond to form-feed etc. commands.

★ User defined characters are printed as you see them on the screen so that non-standard characters are automatically printed out correctly.

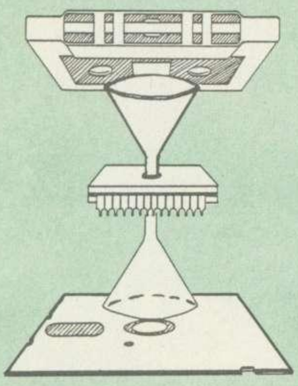
★ Commands select the options for the following printers:
GP100, STAR, NEC, MX/FX, KAGA, LP/VII/DMP100, DMP200.
Operates with either parallel or serial interfaces.

★ Supplied with a 50 page manual that is very comprehensive and easy to follow. Please specify printer type when ordering so that we can send the correct function key strip.

Price: £24

TRANSFEROM

(Tape to Disc Utility)



The only TAPE to DISC Utility ROM that works with our Double Density Disc Interface.

After months of top secret development, we are now able to supply details of this advanced and sophisticated utility ROM for the BBC micro. Just look at the features:

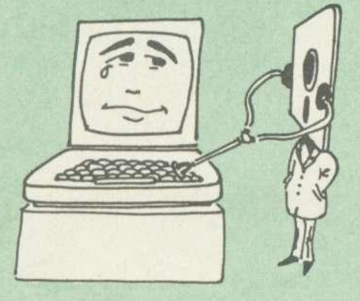
- Fully menu driven for ease of use
- Copes with locked programs
- A very comprehensive built in copying features
- Copies very long adventure games
- Supplied with comprehensive manual

TRANSFEROM is now available in BOTH single and double density versions. The single density version works with both the Acorn and Watford single density DFSs. The double density version works with the Watford DDFS system only.

TRANSFEROM takes your software on tape and saves them onto disc. TRANSFEROM does not stop when one disc is full; you just insert another disc in and carry on with that one! Surely this is the most valuable investment you could make if you have tape software that you wish to transfer to disc! Please specify version required – Single or Double Density.

£22.00

DIAGNOSTICS DISC



The BBC micro is a very complex machine and thus diagnosing a fault can be very difficult. Until now, the only way to discover the nature of a fault was either to find a competent friend with a large degree of patience or to find your nearest dealer and pay him to find out what is wrong.

At Watford Electronics, we realise how difficult it can be when faced with a problem, finding yourself a long way from your nearest dealer, or even just uncertain about your Beeb's health, but not wanting to waste time and money taking it to be looked at.

The solution to these problems is here now, in the form of the Watford's Diagnostics Disc. This excellent utility is specially designed to test out the following areas of your Beeb:

RAMs, ROMs, ULAs, Sound, Keyboard, Disc, RS423, ADC, User Port, Printer Port, Cassette, Joysticks, Speech, Disc Drives, 6502 and Z80 2nd Processors.

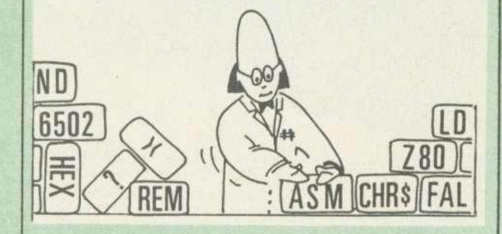
Continued

This utility is an invaluable aid for all those who take the reliability of their system seriously. A comprehensive manual provides full operating details and a list of possible causes and remedies for any faults that you may find along the way. The package also enables a permanent equipment and service record to be maintained.

Only £18.00

ROMAS

THE CROSS ASSEMBLER AND MACRO EDITOR FOR SERIOUS PROGRAMMERS!



ROMAS is a carefully designed, sophisticated yet simple to use, development system for serious assembly language programmers. Using the BBC as the development system, you can choose your target system from the following processors:

6502, 65C02, Z80, 8085, 8041, 6809 and Z8 P.S. This includes the Acorn 6502 & Z80.

ROMAS features a powerful expression analyser, making complex table easy to generate. To aid in documentation, fully formatted assembly listings may be produced, with full symbol table output at the end.

ROMAS is provided with a powerful cross referancer to produce a listing of all the labels in a given "source" program; this makes it easy to check to see if you are about to duplicate a label.

The Macro Editor

Features of this powerful editor provided with the ROMAS package include:

- Works in all 40 and 80 column screen modes
- Fast load and save speeds
- Continuous line and column number displays
- Search, replace and move; all available in macros
- Command repetition

The ROMAS package includes a comprehensive manual, providing detailed documentation and plenty of examples.

A give away at . . . **Only £45**

Please specify 40 or 80 track disc when ordering.

ADE

'Systems' complete program development package in a 16K ROM. We are now supplying the new 6502 2nd processor compatible version.

SPECIAL OFFER ONLY **£43**

ULTRACALC 2

The mark 2 version of the BBC Publications' extremely popular electronic spreadsheet ROM.

Only: **£66**

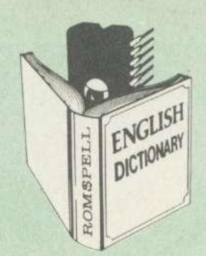
THE INVESTIGATOR

This sophisticated Utility program on disc, enables you to make security back-up copies of most of your valuable Disc Software. Makes full use of all 8271 (will not run with double density DFSs) facilities to discover the precise format of your protected disc so that an exact copy can be produced. Supplied with detailed instructions. Please specify 40 or 80 track disc when ordering.

Only **£20**

ROM-SPELL

"way ahead of any competition"



ROM-SPELL is probably THE most advanced spelling checker available for the BBC Micro. Printed below are some extracts from a recent independent review (A&B Computing Nov. '85), which we feel sure will convince you that this is THE only spelling checker worth considering.

"The editing system is very neat and simple, instead of replying to queries and beeps all of the time . . ."

"The other feature which places ROM-SPELL way in front of any competition is the ability to examine the user dictionary, so any spelling mistakes that have found themselves on the disc can be examined and taken out if necessary".

". . . that it is compatible with many of the popular word processors on the market is a good indication that ROM-SPELL is going to be a very popular product indeed".

". . . ROM-SPELL is by far the best spelling checker for the unexpanded BBC B (with or without word processor). It boasts features which are hard to find on conventional spellcheckers on CP/M and MSDOS, namely Spellstar and has a speed/performance ratio of roughly the same as its CP/M cousin. The difference is that the CP/M version would cost the best part of £500".

". . . and with such vital house keeping features as an ambiguous word checker, the ability to edit the user dictionary, a comprehensive manual that is both easy to read and actually ENJOYABLE to learn from, . . . I feel confident that ROM-SPELL will woo the word processing public with no problems at all".

ROM-SPELL costs only **£25**

(Please state 40 or 80 track disc)

DISC EXECUTOR

Disc Executor is a sophisticated disc utility for the transfer of your programs from cassette to disc. It copes with 'locked' files and full length adventures (up to &6E blocks long) and programs that load below &E00. Disc Executor is simple to use and provides menus to prompt the user along the way. Disc Executor will cope with the vast majority of tapes. (Please note that Disc Executor is not compatible with double density disc interfaces – keep reading our adverts though!)

Price only **£10** (40 or 80 track)

BEEBMON

BEEBMON is the most powerful and versatile machine code monitor from Watford Electronics. BEEBMON offers some superb features specially designed to make the task of understanding and debugging machine code easier; indeed BEEBMON is probably the only product with sufficient power to aid in the debugging of such complex pieces of software as a DFS.

Offering a total emulation mode, BEEBMON can be used to single step through code anywhere in memory. All breakpoints are emulated and the workspace is totally relocatable, allowing for the simulation of all those "awkward" pieces of code.

£24

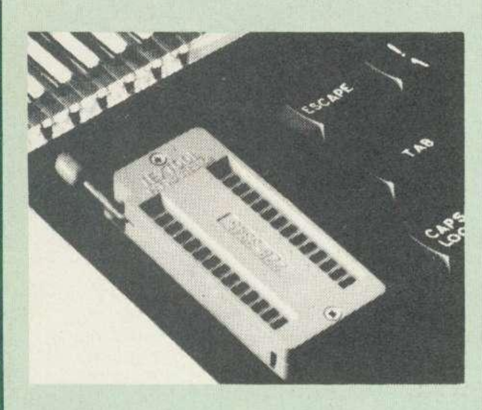
DISASSEMBLER ROM

Discover the hidden secrets of BASIC and the OPERATING SYSTEM with this easy to use progammers tool.

ONLY **£16**

Please write in for technical details.

SIDEWAYS ZIF SOCKET



Now Watford Electronics brings you a ROM board for small budgets or for those of you who do not wish to open up your Micro frequently. It allows you to change ROMs quickly and efficiently with the minimum of effort – no screws to loosen or keyboard to remove. The unit consists mainly of a zero insertion force (ZIF) socket on a small circuit board which is located into the position of the 'ROM Cartridge' and is connected to one of the internal ROM sockets via a ribbon cable.

● Very simple to install. NO SOLDERING REQUIRED. The ZIF eliminates the possibility of damage to your ROM pins when inserting and extracting them.

● The low profile of the socket allows unrestricted access to the keyboard, unlike other cartridge systems. In addition, there are no costly extras, such as ROM cartridges for every new ROM.

● All data and address lines are correctly terminated to ensure correct operation of suitable ROMs with the BBC micro. We also supply a purpose designed see-through storage container with anti-static lining, allowing you to store up to 12 ROMs, protecting them from mechanical and static damage.

● This versatile hardware solves the problem of running out of socket space, simply unplug the ROM and plug in a different one. It is a real must for Professionals and Hobbyists alike.

ONLY **£15**

16K Sideways RAM Modules

This is it! The revolutionary design RAM Module you've been waiting for. Complete with such features as read and write protection, these new modules from Watford Electronics are ideal for the hobbyist, software developer and ROM collector.
Key points to note about this new addition to the Watford range of products are:

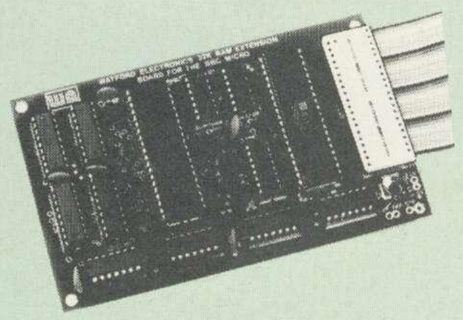
- Write protection (useful in a variety of circumstances).
- Read protection (allows recovery from ROM crashes).
- Compact construction.
- May be fitted in systems even with a ROM board.
- Multiple units may be fitted, even with a ROM board.
- No overheating or overloading problems.
- Free utilities disc supplied.
- Can be used as a 16K PRINTER BUFFER.
- Works with any ROM.
- Ideal for professional software development.
- Writes in &8000 to &BFFF region go to RAM.
- Assemble and *LOAD ROMs straight in to RAM.
- Supplied with utilities software disc.

Introductory offer: **£29**

Optional extras

READ and WRITE protect Switches **£2**
BATTERY BACKUP £2

32K RAM- PRINTER BUFFER EXPANSION BOARD



A MUST FOR WORD PROCESSING

Watford Electronics now brings you the latest state-of-the-art MEMORY EXPANSION BOARD for your BBC microcomputer. Just plug the ribbon cable into the 6502 processor socket, and fit the compact board inside the computer. Immediately you will gain not 16K or even 20K, but a massive 32K of extra RAM!!!

● IMPROVE your WORD PROCESSING system, whether disc or cassette based. Don't wait for a slow printer – type in text while printing. TWO JOBS DONE SIMULTANEOUSLY and £100+ saved on a printer buffer.

● "VIEW" Wordprocessor users can now type in text in 80 columns and have up to 28,000 bytes free – 5 times as much as normal.

● In WORDWISE (or WORDWISE-PLUS), preview in 80 columns with the full 24K of text in memory. This superb product is recommended by Computer Concepts for use with both Wordwise and Wordwise Plus. We wholeheartedly agree with this commendation.

● Combine GOOD GRAPHICS and LONG PROGRAMS. Use the top 20K of the expansion RAM as the screen display memory, leaving all the standard BBC RAM free for programs. Benefit from MODE 0/1/2 graphics and 28K of program space.

● Use the FULL 32K or the bottom 12K of the expansion RAM as a PRINTER buffer for PARALLEL or SERIAL printers, sound channels, RS423 etc. Only 12K Buffer can be used in Wordwise or Wordwise+ because of the way these softwares are written. Print large text files while running long graphics programs and have all your buffer options available as well (*FX15,21,138,145,ADVAL etc). Only 12K Buffer can be used in Wordwise or Wordwise + because of the way these softwares are written.

● Ensure COMPATIBILITY with a vast range of hardware (including Watford & ATPL ROM boards, double density boards, second processors), and software (including BASIC, TOOLKIT, VIEW, WORDWISE (1.20+), WORDWISE-PLUS). This is because our board, unlike those of our competitors, is connected to the computer by a ribbon cable.

● Achieve EASY OPERATION with ROM based software. A large range of commands is available for machine code and BASIC users, including some useful *HELP messages.

Offer price

Only: £59

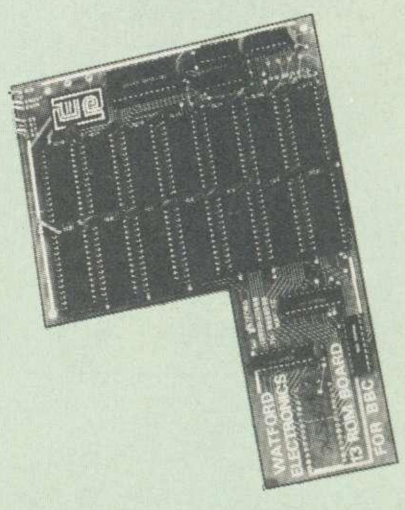
(Price includes a comprehensive manual and the ROM)

GRAPH PAD

With this popular British Micro's Graph-pad, you can add new dimensions to your computer enjoyment. It helps you to create your own application programs by the simple use of the Graphpad. Ideal for Educational use. Supplied complete with Cables, Manual and a two program cassette.

SPECIAL OFFER **£60** (£3 carr)

Mk-3 13 ROM SOCKET EXPANSION BOARD



- Increase BBCs capacity for ROMs from 4 to 16.
- Easy installation; simply plug in with only 5 wires to solder.
- Minimal space needed.
- Compatible with our DDFS, RAM Card, Torch card, 2nd Processors, etc.
- Advanced low power chips keeps power consumption to a minimum.
- Very versatile Socket 14 can take 2716, 2732, 2764, 27128, 6116 and 6264 chips.
- *LOADs or writes in the region &8000 to &BFFF are automatically directed at the RAM.
- Auto-write protect line makes RAM look like ROM.
- READ protect line which makes socket 14 "vanish" – useful to get out of software crashes.
- On-board battery back-up option with a high speed charging circuit.
- Supplied ready-built and tested, complete with fitting instructions.

Price: Still Only £30

SOLDERLESS SIDEWAYS ROM SOCKET BOARD

Following the success of our 13 ROM SOCKET BOARD, we are proud to announce a new addition to our range – the New Solderless Sideways ROM Socket Board.

This brand new board from Watford Electronics is designed specifically for those wishing to add a ROM board to their own BBC without the need to perform any soldering.

This new board expans the total possible number of ROMs in a BBC from 4 to 16. Also permissable, are various configurations of RAM (up to 16k) and different sized EPROMs (see below).

- The key features of this new, no fuss, easy to install quality product from BBC leaders Watford Electronics are as follows:
- Increase your BBCs capacity for ROMs from 4 to 16.
- No soldering required.
- Very low power consumption.
- Minimal space required.
- Compatible with Torch, DDFS, RAM Card, 2nd Processor, etc.
- Socket 14 can take the following chips: 2716, 2732, 2764, 27128, 6116, 6264.
- Auto write protect for RAM chips.
- Read protect to make RAM "Vanish"; allows recovery from ROM crashes.
- Battery backup option for RAM chips.
- Supplied ready to fit with comprehensive instructions.

Price: Only £32
Battery backup fitted **£35**

Watford ROM/RAM CARD

A must for all serious users

Watford Electronics announced the first ever commercial ROM board for the BBC micro, the Watford Electronics 13 ROM Socket Board 3 years ago. Following the success of this board, we have designed what probably represents the ultimate in expansion boards, the new Watford Electronics ROM/RAM board. This highly versatile and sophisticated board represents the latest in "2nd generation" sideways ROM technology for the BBC micro, designed to satisfy the serious BBC user.

- NO SOLDERING required to fit the board.
- NO overheating problems.
- No User Port corruption (avoids problems with the mouse, modems, Eprom Programmers, etc.)
- Fully buffered for peace of mind.
- Firm mounting in BBC micro.
- Compatible with ALL BBC micros (not BBC Plus).
- Total number of ROMs increased from 4 to 8.
- Up to 8 banks of sideways RAM (dynamic).
- Option for 16k of Battery backed CMOS RAM (CMOS RAM needs one ROM socket).
- Write protect for ALL RAM.
- Master write protect for all sockets.
- Read protect for CMOS RAM (ALLEVIATES crashes during ROM development).
- Separate RAM write register (&FF30 to &FF3F).
- Automatic write to currently selected RAM socket for convenience.
- Can run ANY BBC ROM.
- FREE utilities disc packed with software.
- Compatible with our DDFS board, 32k RAM Card, Delta Card, sideways ZIF, etc.
- Large printer buffer.
- UNIQUE Fully implemented RAM FILING SYSTEM (similar to the popular Watford DFS).
- Fast *BACKUP via sideways RAM.
- ROM to RAM load and save facilities.

The RFS (FAM FILING SYSTEM) can utilise up to the full 128k of RAM (with the RFS in CMOS RAM) as a SILICON DISC. This behaves as a disc drive, with all the normal Watford DFS features (including OSWORD &7F for ROM-SPELL, etc.) to provide an environment that looks like a disc but loads and saves MUCH faster.

The ROM/RAM Board plugs into the 6502 CPU socket. This leaves free all the existing ROM sockets, which can still be used normally.

Any ROM that can be plugged into the BBC micro's own ROM sockets may be used in the ROM/RAM Board.

The ROM/RAM Board is supplied with all ordered options fitted as standard. Upgrade kits (with full instructions) are available for all of the options, should the user wish to upgrade in the future. Please write in for further details.

INTRODUCTORY PRICES:

● ROM/RAM card with 32k dynamic RAM	£45
● ROM/RAM card with 64k dynamic RAM	£69
● ROM/RAM card with a massive 128k dynamic RAM	£109
OPTIONAL EXTRAS:	
● 16k plug-in Static RAM kit	£9
● Battery backup	£2
● Read and Write protect switches	£2
Complete ROM/RAM board (all options installed)	£125

Le Modem

The MODEM from Watford

At last a professional MODEM for the BBC Micro. Unlike other 'Modem packages' this is a complete package there are no extra software costs to get 'up and running'. Of course Le MODEM is multi-standard, i.e. 300/300, 1200/75 UK and BELL (USA) are all supported.

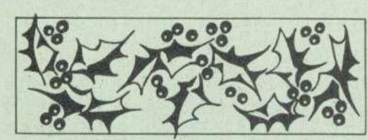
The features that make Le MODEM such good value are:

- *A complete communications terminal that transforms your BBC Micro into a very powerful World/wide data transfer system.*
- *Auto Dials, Auto Answers, Auto Baud selects and is completely controlled by your Micro. There are no external controls!*
- *Allows you to access PRESTEL, B.T. GOLD, THE SOURCE, MICROLINK, MICRONET, MICROWEB, THE TIMES NETWORK, MICRO LIVE (BBC TV database), CITY BB and more.*
- *Designed to be SIMPLE but SOPHISTICATED. To LOGON to a data base all you have to know is its TELEPHONE NUMBER, Le MODEM does the rest.*
- *Supplied with a comprehensive telecomms package in a 16K sideways ROM which includes a FULL PRESTEL terminal allowing TELESOFTWARE to be downloaded.*
- *A comprehensive 80 column terminal. This includes XMODEM error checked transfer protocol, to allow error free data transfer anywhere in the world!*
- *FULLY controlled by simple '*COMMANDS allowing you to control it from your own BASIC programs. To get you started we supply a FREE disc of bundled software!*
- *Connects to the 1MHz bus. A *AUDIO ON/OFF command allows you to actually hear the telephone line through your BBC micro loudspeaker.*
- *Completely self contained with internal mains power supply. (Even a free mains plug is fitted!) A *TEST facility gives ON SCREEN indication that Le MODEM is working correctly.*
- *Packaged in such as way that you need nothing else except a BBC Micro to communicate with computers all over the world.*

- *BT Approval applied for.*

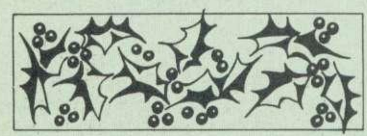
Launch Price: Only **£89** (carr £3)

(Price includes Software ROM, Cables and Manual)

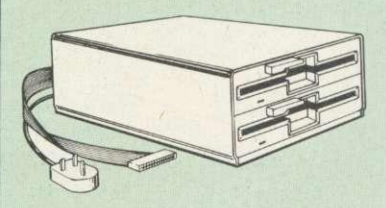


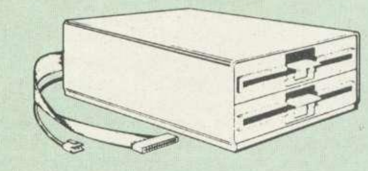
CHRISTMAS GIFT VOUCHERS

Following numerous requests from you the customers, we have at last introduced our GIFT VOUCHER service. The Vouchers are available in £5; £10 & £15 denominations and are an ideal answer when faced with that problem of what to give for that special Birthday/Christmas gift. Simply send your credit card number or your cheque for the amount of Vouchers you require and we shall send you these attractive Vouchers. (There is a 50p handling charge on any amount.)



CHRISTMAS DISC DRIVE OFFER





Watford Electronics has always been renowned for bringing high quality products to the consumer at realistic prices.

For the Christmas period, Watford is offering an even better deal on their top quality slimline MITSUBISHI DISC DRIVES for the BBC micro.

Packaged in matching decor the BBC micro, these superb disc drives are an ideal complement to any DFS on the BBC. Backed by a twelve month warranty from Watford, UK's largest distributors of BBC micro peripherals. You can be sure of a great deal from Watford.

The following 40/80 track switchable Disc Drives are being offered at rock bottom prices. The price includes a Utilities Disc. (For technical specification, please see the opposite page.)

● CLS400S Single 40/80 track switchable Disc Drive, cased with cables	£79
● CLD800S Twin 40/80 track switchable Disc Drives cased with cables	£159
● CS400S Single 40/80 track switchable Disc Drive cased with cables & Power Supply	£79
● CD800S Twin 40/80 track switchable Disc Drives cased with cables & Power Supply	£159

BUY NOW & SAVE £ £ss . . .

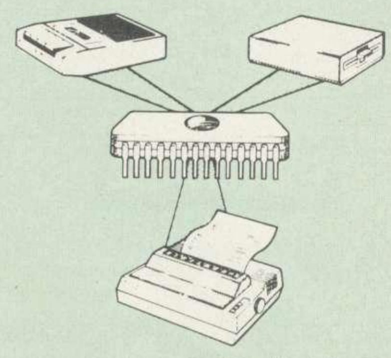
LOGOTRON LOGO

The popular Logotron Logo in RCM. Recommended by most Education authorities.

Only: £55

PCB NI-CAD Battery for ROM Boards. £2

BUFFER & BACKUP ROM



For those with sideways RAM fitted in their machines this utility ROM will make full use of this facility. By using the sideways RAM area for extra memory the following features are implemented:

- ★ 4K or 16K buffer for parallel printer.
- ★ Dumps selection of Disc files to Tape.
- ★ Makes backup copies of tapes on to tape and disc.
- ★ Displays contents of paged ROMs on screen.
- ★ Menu display of ROM filing system contents on Shift-Break.
- ★ Comprehensive manual.

Only £20

LUCKY 13

To celebrate our 13th Birthday we will be offering some sensational bargains at the Electron & BBC Micro User Show on November 14-17.

SEE YOU AT THE SHOW

NAZIR P. JESSA



Continued



Marconi TRACKER BALL

This popular Marconi's RB2 tracker ball now available with the popular Micro-Draw software.

Only: **£49**

COMPUTER CONCEPT'S ROMS

ACCELERATOR	£52
CARETAKER Basic Utility	£27
Graphics ROM	£26
Disc Doctor ROM	£26
INTER-SHEET	£45
INTERCHART	£34
TERMI	£27
COMMUNICATOR	£58
SPEECH ROM	£26

Wordwise

Without doubt a very sophisticated piece of software for the BBC Micro. It has all the features of a professional word processor yet is easy to use.

SPECIAL OFFER: **£32**

WORDWISE PLUS £46

FREE FREE FREE

This month we are giving away absolutely FREE, the superb Word-Aid ROM worth £15, with every WORDWISE PLUS package bought from us.

Word-Aid

The most comprehensive utilities ROM for Wordwise-Plus

Extend the power of your Wordwise Plus word processor with this most advanced ROM from Watford. By utilising the powerful Wordwise Plus programming language, WordAid provides a whole host of extra features, all accessed via a special new menu option.

- Alphabetical sorting of names and addresses.
- Text transfer options.
- Chapter marker.
- Epson printer codes function key option.
- Search and display in preview mode.
- Embedded command removal.
- Print Multiple copies of a document.
- Multiple file options for print and preview.
- Address finder.
- Label printer.
- Mail-merger.
- Number/delete/renumber.
- Clear text/segment area.

Price; Only **£16**

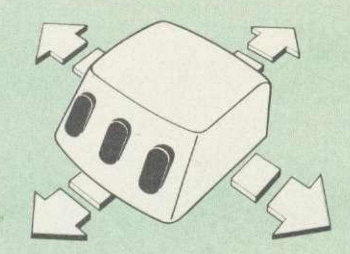
EPSON HI-80 PLOTTER

The latest addition to the popular range of EPSON Printers/Plotters. Prints in upto 10 colours. Has many more features. Please write in for spec sheet.

£345 (£7 carr.)

THE AMX MOUSE

The AMX Mouse needs no introduction. It is simply the best.



Now supplied with the NEW SUPERART Software ROM & Disc at no extra cost.

ONLY: £67.95

We are giving away the sophisticated **COLOUR ART** Software package **ABSOLUTELY FREE** with every purchase of the AMX Mouse from us.

AMX DESK Package	£19.00
AMX UTILITY Package	£11.50
AMX SUPERART Package	£43
AMX PAGE-MAKER Pack	£43
AMX 3D ZICON Disc	£21
AMX Database Disc	£21
AMX XAM Educational	£21

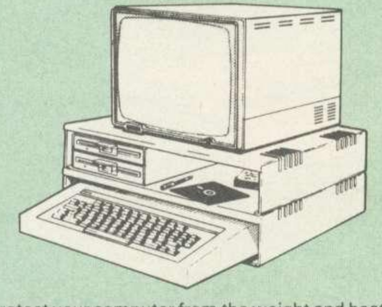
COLOUR ART

This novel program allows you to add COLOUR to any drawing produced with your AMX Mouse package, and really brings those pictures alive. Not with just any colours, mind you, but a full range from up to 255 different shades! It's simplicity itself to use this "painting by numbers" painter to create simple, striking and powerful images to please the eye.

Price **£10**

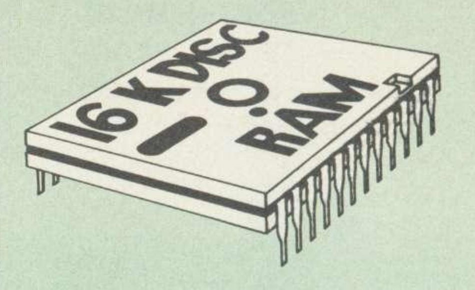
(please specify 40 or 80 track disc when ordering)

PLINTHS FOR BBC MICRO AND PRINTERS



Protect your computer from the weight and heat of your monitor. The BBC micro plinths have slots for maximum ventilation. The single plinth is suitable for a BBC and monitor, whilst the double height version provides enough room for our stacked or side-by-side dual disc drives or TORCH Disc pack, to be placed in the centre section. If you use our stacked drives, the remaining space can be used for further peripherals e.g. Speech Synthesizer, EPROM programmer or simply stationery. The computer slides neatly in to the lower section allowing easy access to remove the lid. The printer plinth is equally sturdy but without the cooling slots. It allows for access to the paper from the front as well as from the rear, (a facility not often thought of in similar products) if the paper is located beneath the plinth. This is a very convenient way to work especially if your work area is not deep enough to take the printer and paper separately.

SINGLE BBC PLINTH	**£11** (carr. £1.50)
DOUBLE BBC PLINTH	**£19** (carr. £2.00)
PRINTER PLINTH	**£10** (carr. £1.50)



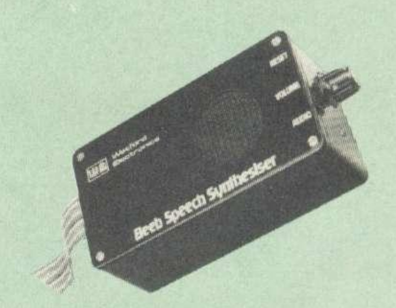
This is the RAM you've been waiting for!! This battery backed up, write protectable 16K sideways RAM board allows you to run from disk every sideways ROM available. Beware of other sideways RAM boards which are not backed up as certain ROMs will not run in these boards even though the RAM can be write protected. The Battery Backup facility allows retention of DATA after power off. On switch on the Micro will think the WATFORD DISC RAM is a ROM. Features available are:

- No soldering or modifications to BBC micro necessary.
- Plugs into normal ROM socket fitting neatly under the keyboard allowing room for other add-ons.
- Easy to use. Comes with disk based software to SAVE and LOAD ROMs. Allows you to make backup copies of your ROMs.
- Disk software can be copied onto other discs when disc is full.
- All existing ROMs can be stored on disk and used in DISC RAM.
- No messy plugging and unplugging of your ROMs. Simply Load the one you want into DISC RAM.
- Ideal for Professional users to develop ROMs. Backup facility allows testing of final versions without using EPROMs.
- The switch provided allows backup and write protection to be switched off externally.
- Can also be used as 16K printer buffer RAM in conjunction with our Buffer & Backup ROM.

New Low Price: £30

P.S. 16K DISC RAM Board is not designed to work in conjunction with a Sideways ROM Board.

Versatile BEEB SPEECH SYNTHESISER Unit



The Watford Speech Synthesiser is a very flexible speech synthesis unit based upon the powerful phonemes system. This system stores the building blocks of speech (called phonemes) and allows you to combine them quickly and easily to form virtually any word imaginable.

Supplied with an advanced ROM, you are provided with a 500 word dictionary to get you started. These can easily be added to by following the notes given in the comprehensive manual.

SPECIAL PRICE £32

BOOKS (No VAT on Books)

21 Games for the BBC Micro	£5.95
30 Hour BASIC (BBC Micro)	£6.95
35 Education Programs for BBC	£6.95
100 Programs for BBC Micro	£6.95
6502 Assembly Language Program	£13.95
6502 Assembly Language Subroutines	£19.95
6502 Machine code for Humans	£7.95
68000 Assembly Lang. Programming	£19
A young persons guide to BBC Basic	£4.50
Advanced Machine Code Technique for BBC	£7.95
Advanced Programming for the BBC Micro	£6.95
Advanced User Guide for BBC Micro	£11.95
Advanced Graphics with BBC	£9.95
Advanced 6502 Programming	£12.45
Assembly Language Programming on BBC Micro	£7.95
Advanced Programming Techniques for the BBC Micro	£7.95
Applied Assembly Lang. for BBC	£7.95
Assembler Routines for the 6502	£**XXX**
Assembly Language Programming FOR the BBC Micro	£8.95
Assembly Programming made Easy	£5.95
Basic ROM User Guide	£9.95
BBC BASIC for Beginners	£7.95
BBC BASIC	£5.95
BBC Forth	£7.50
BBC Hardware Projects	£8.95
BBC Machine Code Portfolio	£7.95
BBC MICRO add on guide	£6.95
BBC Micro An Expert Guide	£6.95
BBC Micro Assembly Language	£7.95
BBC Micro Book BASIC Sound & Graphics	£7.95
BBC Micro Games Master	£5.95
BBC Micro Graphics and Sound	£6.95
BBC Micro Programs in Basic	£5.95
BBC Micro ROM Book	£9.95
BBC Micro **ROM PAGING** System Explained	£2.00
BBC Micro Revealed	£6.95
BBC Micro Disc Companion	£7.95
BBC Micro in Education	£6.50
BBC User Guide	£10.00
BBC Wargaming	£8.95
Basic Programming on BBC Micro	£5.95
BCPL User Guide	£15
Brain teasers for BBC micro	£5.95
Business Applications on BBC	£7.95
Computing for All the Family	£6.45
CP/M Bible	£16.00
CP/M Handbook with MPM	£13.95
CP/M Soul of	£14.95
CP/M The software BUS	£8.95
Creative Animation & Graphics	£7.95
Creative graphics on BBC Micro	£7.50
DISC FILING SYSTEM (DFS) Operating Manual for BBC	£6.95
Disc Programming Techniques	£7.95
Disc System for the BBC	£6.95
Discover BBC Machine Code	£6.95
Discover FORTH	£13.95
Easy Programming for the BBC Micro	£5.95
Electron Machine Code for Beginners	£6.95
Exploiting BBC Basic	£6.95
Exploring FORTH	£6.95
Filing System & Databases	£7.95
Further Prog. for BBC Micro	£5.95
FORTH on the BBC Micro	£7.95
Forth Programming	£14.40
Functional Forth for the BBC Micro	£5.95
Games BBC Computer Play	£6.95
Getting more from your BBC & Electron	£6.95
Graphics for Children	£7.95
Graphs & Charts on BBC Micro	£7.50
Graphic Art for BBC Computer	£5.95
Hackers Handbook	£4.95
Handbook of Procedure & Functions for the BBC Micro	£6.95
Interfacing Projects for the BBC	£6.95
Introducing the BBC Micro	£5.95
Introducing LOGO	£5.95
Introduction to FORTH	£8.95
Introduction to PASCAL	£16.50
Let your BBC teach u to program	£6.45
LISP	£9.25
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LISP Cassette	£15.50
Logo Programming	£8.95
Mysteries of DISC DRIVES and DFS REVEALED	**£5.95**
Mastering CP/M	£16.50
Micronet Handbook	£6.95
Programming the 6502	£13.95
Programming the BBC micro	£6.95
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Structured Prog. with BBC BASIC	£6.50
The Complete FORTH	£6.95
The Complete Programmer	£5.95
The Epson FX/KAGA PRINTER Commands REVEALED	**£5.95**
Using Floppy Discs with BBC Micro	£5.95
Using BBC Basic	£6.95
Wordstar & CP/M made easy	£7.45

BEEB VIDEO DIGITISER

Using any source of composite video (colour or monochrome) and the Watford Beeb Video Digitiser, you can convert an image from your camera into a graphics screen on the BBC Micro.

This uses the full graphics capacity of the BBC micro in modes 0, 1 or 2. The video source may be a camera, video recorder or television, and is connected via the video output socket.

Images produced can be compressed, stored to disc, printed on an Epson compatible printer, directly used to generate graphics, analysed for scientific and educational use or converted to other formats e.g. Slow Scan TV or receiving a picture from a remote camera using a modem.

The output from the digitiser exactly matches the graphics capability in each mode, with up to 8 levels of grey in mode 2. The unit connects into the User Port and automatically scans a complete picture in 1.6 seconds.

Both the black and white levels can be adjusted manually for the optimum picture, or switched to automatic for unattended use. The image produced can be reversed if necessary.

Full controlling software is supplied on a normal sideways ROM and this is easily accessed via additional * commands. The package is designed to allow easy input of complex screens and give full access of the data to the user. Once on the screen, the image can be used as a normal graphics screen, allowing any of the usual graphics commands in BASIC or other ROM's to work on it.

A special print dump routine is included with the driver programs. This is specially designed to produce a fast, correctly proportioned picture, with reduced "contouring", resulting in an accurate reproduction of the original image.

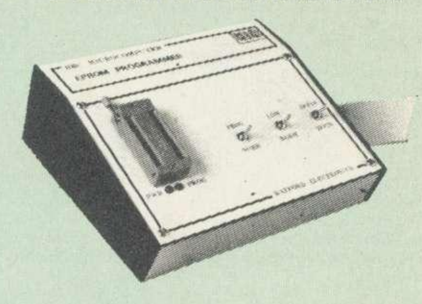
Features offered by this package include:
- The adding of pictures or written text to typed documents.
- Unattended recording of scientific data.
- Entry of real images into graphics programs.
- Generation of computer images.
- Slow scan television; sending images via a modem or radio.
- Security.
- Input from any video 1v video source.
- Full resolution in Modes 0,1 or 2.
- 1.6 seconds scan time.
- Up to 8 grey levels
- Manual or Auto level control
- Connects to user port

Detailed examples of driving this unit from BASIC or other languages are all provided in the extensive manual supplied.

£95 (Carr. £3)

(Price includes: Digitiser Unit, ROM & a comprehensive Manual.)

EPROM PROGRAMMER



The Watford Electronics' EPROM programmer for the BBC micro is a high quality self contained package. Programs all popular EPROMs from 2K to 16K: 2716, 2516, 2532, 2564, 2764 and 27128. All manufacturers' specifications have been followed to program EPROMs at the correct speed – wrong timings could destroy your EPROMs. The unit has its own power supply so does not put heavy loads on the BBC power supply as do some other units. Connects directly to the 1MHz bus following all Acorn recommendations on addressing and bus loadings.

SOFTWARE PACKAGE
The software is supplied on an EPROM which plugs into the Micro and is instantly available with a single command (no time wasting as on Cassette/disc loading). It is a fully purpose designed and ingegrated package to simplify ROM development. The system is menu driven with many prompts to avoid any accidents.

Software facilities include:
Load File – Save File – Down Load EPROM – Program EPROM – Verify – Blank Check – Editing of memory contents prior to programming.
Also included is an automatic system to allow Basic programs to be put in EPROM and accessed through the *ROM filing system. More than one program may be put in an EPROM. All these facilities and more are explained in the comprehensive and clear 15 page manual.

SPECIAL OFFER £69
(£3 carr.)

LOW COST 'DIN' EPROM PROGRAMMER

A high performance, low cost, self contained 'DIN' EPROM PROGRAMMER for the BBC Micro. Plugs into the BBC Micro's user port.

The features are:
- Will program 2716, 2732, 2532, 2764 & 27128 EPROMs.
- Copy Eprom into memory and compute checksum.
- Blank check EPROM.
- Program EPROM from memory.
- Verify programmed EPROM and display checksum.
- All * commands may be used from menu mode.
- High speed programming on 2764 & 27128.
- Machine code SOFTWARE supplied in ROM.

Only: **£49.50** (carr. £2)

TEX EPROM ERASERS

EPROMs need careful treatment if they are to survive their expected lifetime. Over erasure of EPROMs very rapidly turns them into ROMs! The TEX erasers operate following the manufacturers specifications to give the maximum possible working life by not erasing too fast. We use these erasers for all our own erasing work.
- **ERASER EB** – Standard version erases up to 16 chips. **£28**
- **ERASER GT** – Deluxe version erases up to 28 chips. Has automatic safety cut-off to switch off the UV lamp when opened. **£30**
- Spare UV tubes. **£9**

VOLTMACE JOYSTICKS

DELTA-14 JOYSTICK	£12
Adaptor Module	£12
Transfer Software	£7

ANTI GLARE MONITOR SAFETY SCREEN

Headaches? Tired Eyes? Don't take pills – Use Watford's Anti-glare screen filter. Made in Britain by a long established glass maker. Available in 14" version. – Please specify monitor type when ordering.

Special Price: **£13.00** (carr. £2)

SURGE PROTECTOR Plug

Fitted in place of your normal mains plug, this device protects your equipment against mains surges. Nearby lightning strikes, thermostats switching and many other sources put high voltage transient spikes on to the mains. This can lead to data corruption in memory and on disc and can result in spuriously crashing machines. A must for every computer user.

Protection for only **£9.50**

FLEXIBLE KEYBOARD CONNECTOR

A 'Keyboard to Micro' replacement jumper lead.

£4

ATTACHE CARRYING CASE for BBC Micro

The Attache carrying case is attractively finished in mottled antique brown leatherette. The case is made of tough plywood, providing a very solid and safe way to carry your BBC micro. There is room provided to fit all the leads necessary behind the computer and manuals in the front. Locks supplied with two keys. Price **£11** (£2 carr.)

DATA RECORDER

Top quality slimline portable cassette recorder designed specifically for use with home computers. Mains/Battery operated with tape counter.

£20

DATA CABLE to connect recorder to BBC **£2.00**

DATA CASSETTES

Top grade tested C12 Data cassettes supplied in library cases **35p** each; 10 for **£3.20.**

CONNECTING LEADS

(All ready made and tested)

CASSETTE LEADS 7 pin DIN Plug to 5 pin DIN Plug + 1 Jack Plug	£2.00
to 3 pin DIN Plug + 1 Jack Plug	£2.00
to 7 pin DIN Plug	£2.50
to 3 Jack Plugs	£2.00
6 pin DIN to 6 pin DIN Plug (RGB)	£2.50

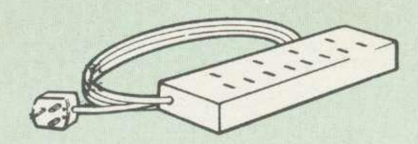
DISC DRIVE POWER LEADS

Supply from BBC power supply to standard Disc Drive connector.
Single **£3.00** Dual **£3.75**

MISCELLANEOUS CONNECTORS

	Plugs	Sockets
RGB (6 PIN DIN)	30p	45p
RS423 (5 pin Domino)	40p	50p
Cassette (7 pin DIN)	25p	65p
ECONET (5 pin DIN)	20p	30p
Paddles (15 pin 'D')	110p	215p
BBC Power Plug 6 way	80p	–
Disc Drive Plug 4 way	75p	–

4 WAY MAINS DISTRIBUTION SOCKET



4 way top quality mains trailing sockets. Supplied wired up with mains plug ready for use. Can be screwed to floor or wall if required. Very useful for tidying up all the mains leads from your peripherals. Allows the whole system to be switched on from one plug.

£9.99



CREDIT CARDS 24 HOUR HOT LINES
ACCESS 0923 50234
VISA 0923 33383

SPARES for BBC Micro

Keyboard	£46;	Keystrip	£2
Power Supply	£45;	Case	£25
UHF Modulator	£4;	Speaker	£2
Speaker Grill	£1;	Keyswitch	£2

28 pin ZIF SOCKET (Textool) **£6.95**

28pin DIL HEADER PLUG

SOLDER type	£1.50
IDC CRIMP type	£1.95

RIBBON CABLE

28way **55p/ft;** 34way **60p/ft.**

8way DIP SWITCH **£0.85**

CHIP SHOP

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74LS04	25p;	74LS10	25p
74LS123	80p;	74LS163	70p
74LS244	80p;	74LS245	£1
74LS393	£1.20;	4013	60p
4020	£0.90	4816	£1.00
DS3691	£3.50	DS88LS120	£3.00
LM324	£0.45	UPD7002	£4.40
6502A CPU	£5	65C02 CPU	£9.50
6522	£3.40	6845SP	£6.75
SAA5050	£8.75	SN76489	£5.50
2764-250nS	£2.00	27128-250nS	£3.00
6116LP-2K	£2.75	6264LP-8K	£4.00
8271	£45	ACORN DNFS	£15
ACORN OS 1.2	£6	ACORN BASIC 2	£16

Acorn BCPL **£50;** Acorn COMAL **£43;** Acorn FORTH **£43;** Acorn LOGO **£60;** ISO Pascal **£60;** MUROM **£17;** SLEUTH ROM **£24;** TOOLKIT ROM **£23;** TERMULATOR **£30;** SERIAL ULA **£13;** VIDEO ULA **£15.** BBC A to B Upgrade Kit **£45.**

ALNOOR ARABIC ROM

Now available from stock, ARABIC ROM and Keytops for the BBC Micro. Please write in for further details.

Acorn's GRAPHICS ROM
£24

ACORN MUSIC 500 SYSTEM
Only: **£165**

Glentop's 3D GRAPHICS Development System
Only: **£22**

BEEBFONT ROM

BEEBFONT is a remarkable and different concept in BBC software. It allows you to display text on the screen in 13 different styles. It is supplied complete with a Spooler and Editor on 40 or 80 track disc.
(Please write in for technical details).

ONLY **£25**

ROM MANAGER

Probably the most powerful way of expanding the BBC micro is from the use of Sideways ROMs. One problem faced by the avid ROM collector is that of ROM command clashes. The solution is very simple in the form of the ROM that "Provides comprehensive management of all your installed ROMs". (Quote from BEEBUG November '84.)

Basically, ROM Manager offers you the ability to turn off any installed ROM, or to send any * command to any specific installed ROM. It is said that imitation is the sincerest form of flattery – Acorn's BBC Plus features many of the abilities of this powerful ROM.

Many more facilities available.

Price **SPECIAL OFFER £18**

ROM EXTRACTION TOOL

This extremely useful tool allows trouble free IC removal from your computer. No longer do you have to weald a screwdriver at your valuable ROM software. Instead this IC extractor distributes the removal force over the whole body of any 24 or 28 pin chip, thus preventing undue damage to your Chip. Isn't £2 a small price to pay to protect your ROMs stature?

Price: **£2**

Call in at our shop for a demonstration on any of the items listed in this advert† Be satisfied before your buy. You may write in for a technical leaflet on any of our products. (An SAE will be appreciated.)

SEE YOU AT THE ACORN & BBC MICRO USER SHOWS

Prices subject to change without notice and available on request.
MAIL ORDER AND RETAIL SHOP. TRADE AND EXPORT INQUIRIES WELCOME.
GOVERNMENT AND EDUCATIONAL ESTABLISHMENTS OFFICIAL ORDERS ACCEPTED.
CARRIAGE: Minimum £1 on all cash orders. On bulky items, Securicor charge applies.
VAT: UK customers please add 15% VAT to the total cost incl. Carriage.
SHOP HOURS: 9.00am to 6.00pm. Monday to Saturday. (Ample Free Car Parking Spaces)

Watford Electronics

Dept. AU, JESSA HOUSE, 250, Lower High Street, WATFORD, ENGLAND
Credit Card Orders TEL: ACCESS (0923) 50234 VISA (0923) 33383
Telephone: (0923) 37774; Telex: 8956095 WATFRD

ROUND AND ROUND THE GARDEN

Add a little extra fun to your Christmas with our exciting game, *Shuggy's Garden.* Deep in the garden a monster is lying in wait, watching you collect the autumn apples, so look out!

Hugh Darby

Here's a game for you to type in the empty hours over Christmas after you've filled yourself with turkey and are fed up with your other presents. *Shuggy's Garden* will run on both the BBC micro and the Electron, and you'll find details of how to enter the listing on yellow page 107.

The scenario is autumn in Shuggy's garden. All the apples are ripening and he would love dearly to collect them, but a monster has entered the orchard, intent on bringing about his demise. Causing yet more chaos, the leaves are falling off the trees, threatening to crush poor Shuggy.

How to play

The aim is to guide Shuggy around the gardens collecting the apples as they appear, while avoiding the ravenous monster. As you attempt this already difficult task, piles of fallen leaves accumulate which bar your path.

If the monster reaches an apple before you, he will eat it, and you'll lose 100 points and forfeit two of your hard-earned apples. The mushroom is the monster's home and if you eat it he becomes infuriated and will chase you, laying a trail of leaves behind him, which makes life exceedingly difficult for you.

You cannot pass through the leaves that fall continuously, but the monster can. As they will always fall along the path you have taken, if you hang about too long, or retrace your steps, you could find yourself getting squashed. To help you, a flashing square indicates where the next pile of leaves is going to fall. Leaves will also appear behind you when you eat an apple, so be careful or you'll end up getting trapped.

There are four different gardens, and the monster speeds up through them, starting at about a fifth of your speed and progressing to half your rate on the fourth screen. Also increasing will be the number of apples you

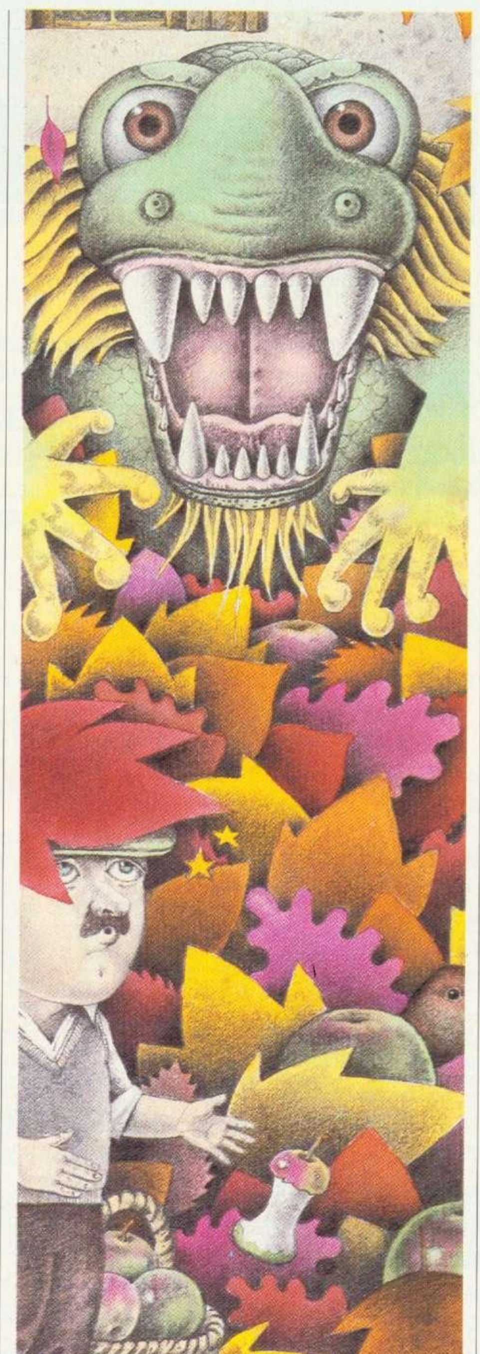


ILLUSTRATION BY KEN LAIDLAW

have to collect, which increments by three for every sheet completed.

When you have completed the fourth screen, you will return to the first screen and the number of apples and speed of the monster will be lowered accordingly – the catch is that the leaves now fall more frequently, and from the third level upwards, the screen quickly becomes almost unnavigable. Points awarded are 100 for an apple, 1000 for the mushroom and one for each square of grass.

The keys used are Z to move to the left, X to the right, while : will take you up, and / down. Press S to turn the tune on or Q if you prefer to play in silence. P/O will allow you to pause or restart as you want.

At the bottom of the screen you'll find your score, the number of lives remaining, the level and screen numbers (in that order), and the number of apples gathered followed by the amount to be collected.

Hints on playing

- Don't eat the mushroom until you need only one or two apples to finish that screen.
- If the apple is in a position where you would become trapped trying to collect it, find a place where the apple is between you and the monster, and wait for the monster to take the fruit as it approaches you.
- Don't stand still for any length of time, and if you have to (as in hint two) move only when you see the flashing square on top of you.
- On the third and fourth screens, if the monster is between you and the apple, it's best to take a circuitous route to get it, as the monster only follows at a half or a third of your speed and you can usually outrun it and get past by going along the edges.

Program details

For speed, the program contains two short sections of assembly. The first is used to determine the character at the current text cursor position, using OSBYTE 135. Al-

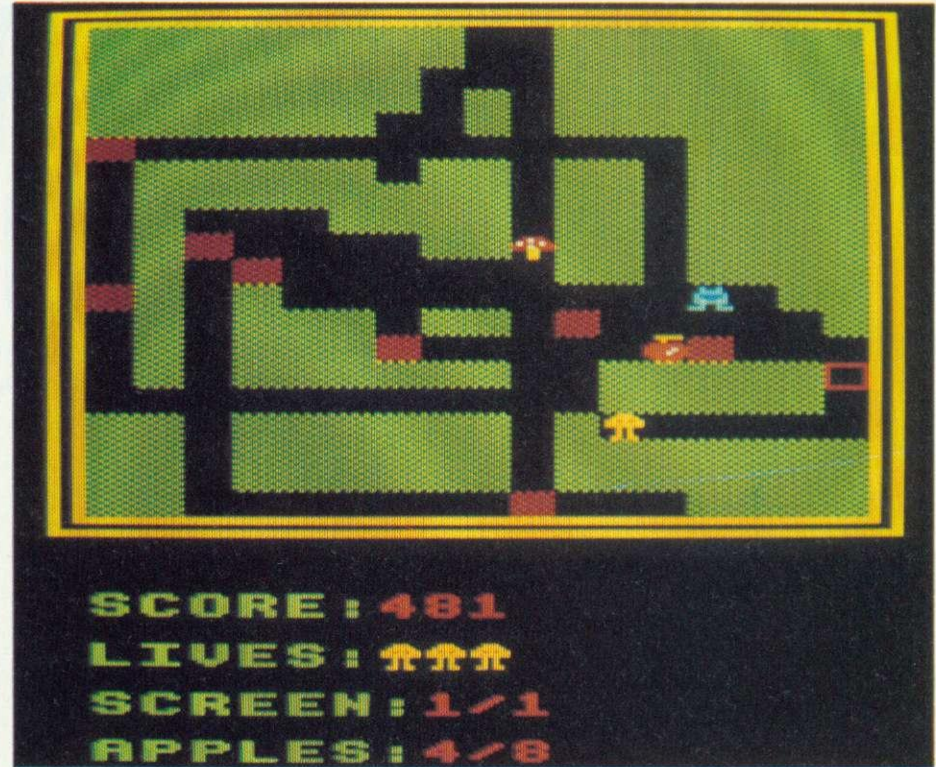
though still short, the routine is longer than it might be, because to obtain the 'correct' character number, 96 has to be added to the result of the call. This can cause complications when checking for characters that are not user-defined (by that I mean less than 224), but when dealing solely with user-defined characters – as in this program – it is a lot simpler than fiddling about with numbers that are all 96 less than you want them to be.

The second section of code is a general purpose routine to print multi-coloured characters on the screen. On entry, locations &70 and &71 contain the screen memory print position, while &74 and &75 contain the data position. This way variables can be set to the various data positions such as sh%, ap% mo%, and so on, and the screen position can be calculated from 'TAB' co-ordinates. These values are then just put into the memory, and one routine is used for all the multi-coloured characters, rather than having one separate routine per character.

This can easily be adapted to your own data, and with some alterations larger characters can be printed, (see *Acorn User* January 1984 pages 103-110 for full details).

Also used in the program is a 'centre-as-you-enter' input routine for the high score name entry. It's very easy to customise this, and you can alter the maximum length by changing the 20 in line 3850 to whatever length you wish, and the allowable characters by re-doing FNvalid.

Finally, to play the tune, rather than use lengthy and complex interrupts, all I have done is to check continuously if the buffer for channel 1 is empty, and, if it is, it will play a note. This ensures that the buffer does not fill up, and thereby freeze the machine until the buffer empties, providing a quick, easy method of playing background music in Basic.



Here are all the features of the game – you, the monster, his mushroom home, piles of leaves and an apple

Turn to yellow page 107 for the listings for Shuggy's Garden

VARIABLES		**dead%**	set if player dead	**update**	prints full player status
A	used for name input	**fin%**	set if screen finished	**player**	moves player
C	colour for monster or man	**char**	result of screen check	**keys**	handles keyboard check
P	set if apple to be printed	**LI%**	lives	**ch2**	check for players' death, etc.
N	pitch of note	**SC%**	score	**gotapp**	collects an apple
D	duration of note	**no%**	number of moves monster gets	**mad**	collects mushroom
C%	position in high scores	**ax%,ay%**	monster co-ordinates	**pr**	prints Shuggy
pass	used in assembly OPT	**mx%,my%**	monster co-ordinates	**apple**	prints/reprints apple
ap%,mo%,	memory locations for graphics	**nx%,ny%**	next block co-ordinates	**block**	drops leaves, makes square flash
mu%,sh%,bl%	data (apple, space monster,	**ox%,oy%**	old player co-ordinates	**monster**	handles monster movement
	mushroom, shuggy, blank)	**x%,y%**	current player co-ordinates	**move**	move monster
Q%,R%	general numeric variables	**ARRAYS**		**pm**	prints monster
pos	position of centered text	**H% (5)**	five high scores	**ch**	checks if monster on player/
pad%	number of dots after high score	**H$ (5)**	names for high scores		apple
so%	set in tune to be played	**FUNCTIONS**		**monapp**	monster eats apple
q%,r%	used for character checking,	**check**	checks character at (q%,r%)	**apsc**	checks for minus score/apples
	position calculation	**input**	inputs a string	**app**	prints number of apples
A$, B$	general string variables	**valid**	checks for valid input	**score**	prints score
loop%	main game loop	**PROCEDURES**		**finish**	takes away life
t%	temporary store for game level	**assem**	sets up machine code	**newscr**	resets for next screen
app%	number of apples needed to	**array**	sets up arrays	**ti**	increases leaf frequency
	complete screen	**var**	sets up constants	**mushroom**	prints mushroom
A%	number of apples collected	**hi**	prints out high scores	**sound**	mushroom chomping noise
co%	time to go before leaves fall	**cent**	centres text	**lives**	prints lives
ti%	time between leaves falling	**screen**	displays screen	**s,m,a,r,b**	prints Shuggy, monster, apple,
scr%	screen player is on	**path (1-4)**	draws paths		mushroom, blank space
mad%	set if mushroom eaten	**var2**	defines all non-constants	**tune**	plays one note in tune

Table 1. Variables, arrays, functions and procedures used in Shuggy's Garden

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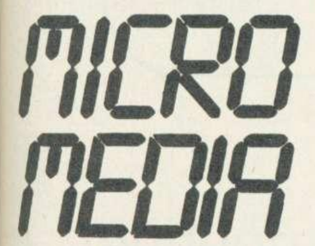


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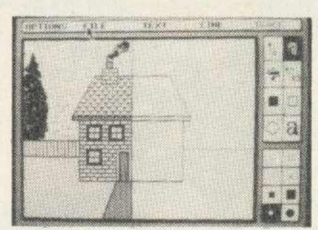
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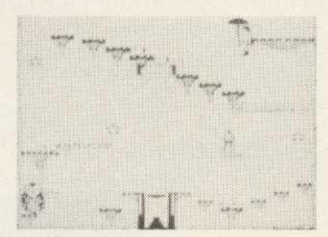
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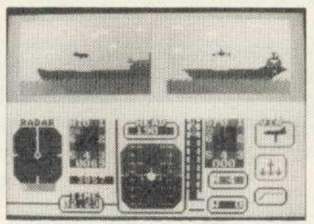
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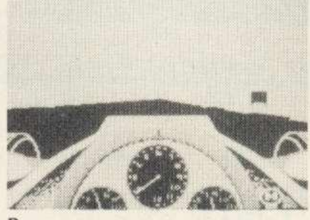
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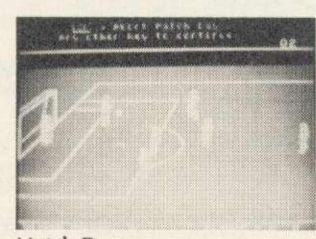
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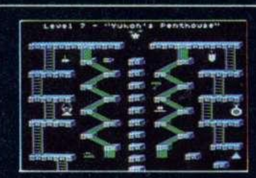
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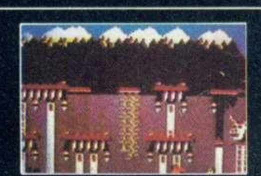
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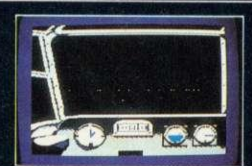
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*All screen shots as seen on the Commodore 64

RECURSION EXCURSION

You can use the technique of recursion in your graphics to imitate natural patterns such as snowflakes, trees and coastlines – the process isn't as difficult as you might think

Jim McGregor & Alan Watt

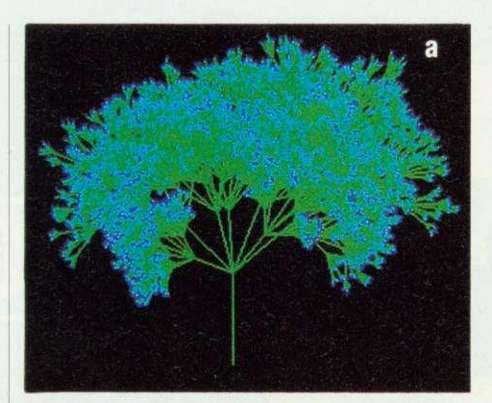
In this article we shall look at the fascinating application of recursive graphics. There are many complex patterns and curves that can easily be described recursively and recursion is a useful tool in computer graphics and computer generated art. Recursive techniques can also be used to imitate natural patterns such as snowflakes, trees and coastlines. The topic is discussed and demonstrated in greater detail in our book *The Art of Microcomputer Graphics for the BBC Micro/Electron*.

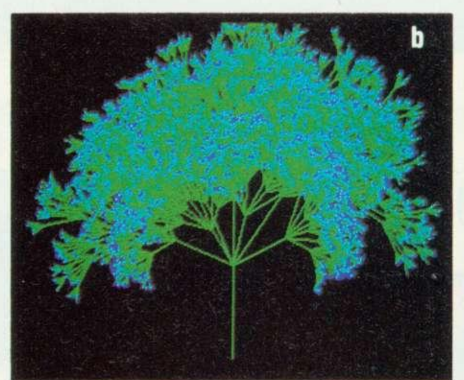
To use recursive graphics you need an understanding of recursion as a programming process. We will start with a simple introduction that does not involve the extra complications of graphics. Once you have understood the process of recursion you can utilise it as a tool in graphics.

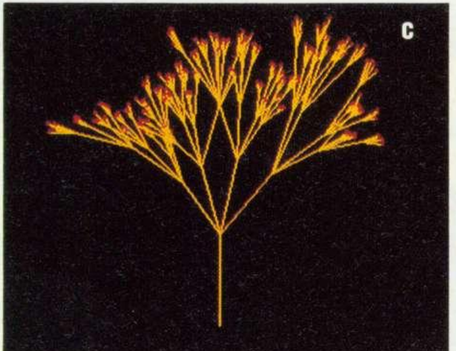
What is recursion?

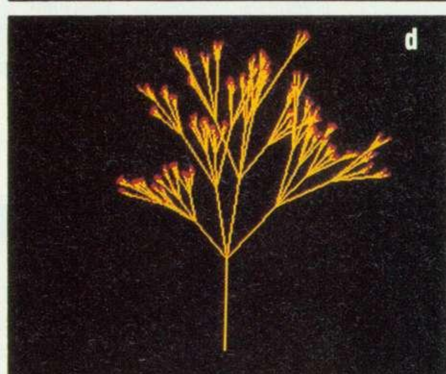
In computing, a recursive process is one that is 'described in terms of itself'. Recursion is viewed with suspicion by beginners, who ask how on earth can an operation be defined in terms of itself? Someone recently remarked to me that writing a recursive program seemed like an act of faith. However, once mastered, recursion is a powerful tool and should not be neglected – there are many programming problems where a recursive solution is elegant and easy to write, and the non-recursive answer is clumsy and difficult.

Many human problem-solving activities are recursive in nature – consider the planning of a route from Trafalgar Square to the British Museum in London. One solution might be to pick an intermediate landmark such as Covent Garden and break the original problem down into how to get from Trafalgar Square to Covent Garden, and from Covent Garden to the British Museum. A problem of navigation has been broken down into two easier subproblems, also of navigation.









These tree shapes were generated recursively by a colour version of listing 4 which will produce a variety of plant-like forms. (a) and (b) are from two runs of the listing using the same 'bushy' parameters. (c) and (d) were generated by the program using the same 'skeletal' parameters

This is the essence of recursion – the solution to a problem is described in terms of answers to easier or smaller versions of the same question. This is the classic 'divide and conquer' approach to problem solving, so important in areas like artificial intelligence. With this simple concept in mind, we move on to the use of graphical recursive techniques in the imitation of coastlines and trees.

Fractals

There are a large number of curves that are variously called space-filling curves or fractals. The term fractal has been coined recently to describe curves or surfaces that become more and more discontinuous the more closely they are examined.

In computer graphics, fractal surfaces have been used successfully to simulate landscapes. The more accurately a fractal curve is plotted, the longer it gets! Many naturally occurring curves and surfaces are fractals, for example, a sponge is a fractal surface, as is the surface of the Earth.

A coastline is a commonly quoted example of a naturally occurring fractal curve. Imagine approaching the planet from outer space – at first sight, a coastline would appear to be a fairly smooth curve. As you get closer, indentations that were not previously apparent would begin to appear. As you get nearer still, you would discover that the sides of these indentations themselves contained further ir-

regularities, and the sequence would continue down to the level of individual grains of sand and even as far as the atomic structure of matter itself.

When you draw a map of a coastline, the amount of detail that you can show depends on the scale of the map. Irregularities that would not appear on a small scale map would have to be included on a larger scale. On a micro, the extent to which we can reduce the scale is, of course, limited by the resolution of the computer and the television monitor. You will reach a stage beyond which any attempts at greater accuracy will simply overwrite pixels that have already been plotted.

Simulating a coastline

You can generate fractal curves that simulate naturally occuring silhouettes such as coastlines or skylines. Techniques like those described can be generalised to three dimensions and used to create natural textures on surfaces in images generated as backgrounds in flight simulators or in computer assisted animation. The mathematics of fractal curves is extremely complex, but we won't cover this in detail in this article.

Natural outlines tend to connect points in a very definite way. The initial shape of a coastline is originally determined by the geological events that formed the landmass. The erosive action of sea and wind then generates random variations which are superimposed on the outline.

We describe in detail how to make a program superimpose realistic random variations on what is initially a very simple shape by replacing successive straight-line segments in the outline by fractal curves that exhibit some degree of randomness.

A completely random curve could be generated by:

```
REPEAT: theta=RND(360)
PLOT 1, 8*COS (RAD(theta)), 8*SIN
(RAD(theta))
UNTIL FALSE
```

However, if you try this, you find that the curve produced meanders aimlessly (with so-called Brownian motion).

We require a curve that connects two points, but exhibits random behaviour between them. The operation used to introduce discontinuity into these curves is to replace recursively a line by an 'equilateral elbow' where the sides of the elbow make an angle theta with the line they replace (figure 1). Thus a single line is broken into two lines, and each of these is broken into two lines. The stopping condition of this obviously recursive process is reached when the line length is less than or equal to the resolution of the screen.

If theta is kept at a constant value of 450, then the familiar C-curve is produced (figure 2). However, the most effective way of generating a realistic 'coastline curve' that connects two points is to select theta at random at every replacement stage.

The range of values that theta is allowed to take determines the character of the coastline, listing 1 on the yellow pages demonstrates this. It generates a random fractal curve between two points, and at each recursive step theta is selected randomly from the range:

— maxthea . . . + maxtheta

Low values of maxtheta result in minor variations in direction and larger values result in more violent fluctuations.

This is illustrated in figure 3 where PROCfractal from listing 1 has been used to connect pairs of points for nine different values of maxtheta ranging from 20° to 60°.

With values of maxtheta greater than 40 or 45, there is a tendency for the curve to turn back on itself. Figure 4 shows a map of Britain and Ireland that has been digitised fairly coarsely. Listing 2 was used to add some realistic variations to the map's outline by generating random fractal curves between successive points round the coast. The best results were obtained by using maxtheta = 40 and by proceeding round the coast in steps of about 50 units of length at a time (figure 5).

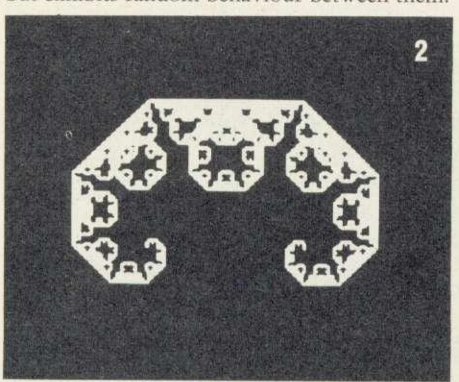
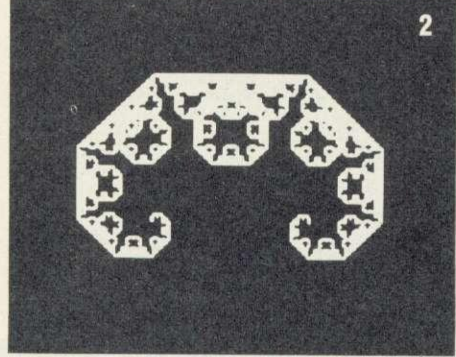
Finally, figure 6 shows the results of colour filling a fractal map of Britain. It was generated by listing 3 which uses an even coarser digitisation than the previous one. The values used are contained in DATA statements. In this data, the coastline is broken into short runs and, at the start of each, the co-ordinates of an

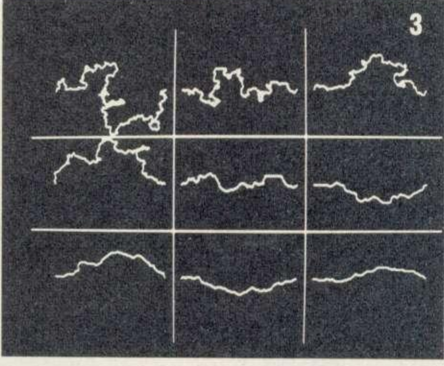
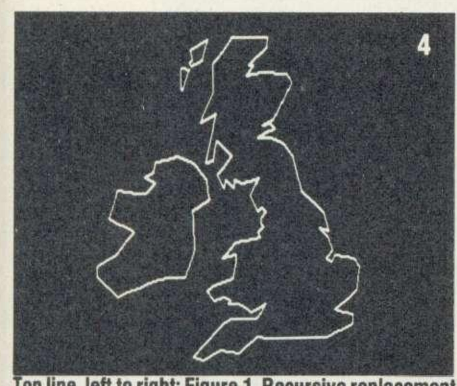
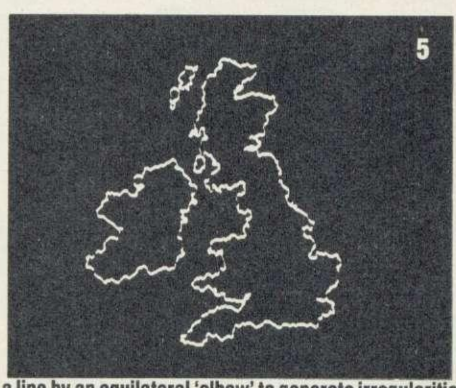
1

θ chosen at random from a specified range

θ

Line that is being replaced


Top line, left to right: Figure 1. Recursive replacement of a line by an equilateral 'elbow' to generate irregularities. Figure 2. A C-curve where theta = 45, resolution = 15. Figure 3. 'Coastline' effects joining two points for various ranges of data (values for maxtheta range from 20 to 60 steps of 5°). Bottom line, left to right: Figure 4. A fractal variation on a map of Britain, coarsely digitised. Figure 5. The same outline, but maxstep = 50, maxtheta = 40. Figure 6. Filled fractal variations on the map

interior point have been included to be used for triangle fill during that run.

Generating trees

Mathematically generated computer art can sometimes mean extracting as much variation as possible from a program by building into it suitable parameters for variation. The resulting differences in shape that are generated by the program can then be tuned to the desired result and is best illustrated in the tree-generating program (listing 4) that will produce a large variety of forms.

The program is a simple example of recursion and uses the design statement: 'A tree is a branch with a tree on the end of it.' To draw the tree we simply write a procedure that draws a branch then recursively calls itself.

Six design parameters are used in the listing. The first, 'rand', is a randomising one. If it is set to 0 there is no random element in the program; if it is changed to 1 then the angle that each branch makes has a random perturbation added to it. The length of the branch is also randomly perturbed.

This means that the program will generate different trees using identical design parameters, but the forms will have an underlying 'sameness', and you can see the nature of this in the illustration on page 82 which is the output from a colour version of the program. One colour is used for the branches and another for the tips.

Figure 7 contains two pairs of pictures – each pair consists of a regular tree, together with its corresponding randomised version. The regular tree is generated with the randomising parameter set to 0 and the randomised tree with the paramater set to 1. The remaining five parameters are identical for each pair.

The significance of these five can be seen in figure 8. They control the overall shape or 'look' of the tree. The first, 'branchfan', is the angle between the first and last branches. The second parameter is 'inpafact' (input angle factor), and this determines the ratio between the branch angles at consecutive depths. The next, 'branchdensity', is the number of branches that emanate from a node. 'Inphf' (input height factor) is the ratio between branch lengths at consecutive depth levels. Finally, 'depth' is the depth of recursion or the number of 'levels' in the tree.

The program can be further elaborated with more design parameters. For example, a finite branch thickness (proportional to branch length) could be incorporated. In the program the terminating 'leaves' are drawn as three extra pixels, but this could also be changed. You could create a windblown tree by making the branches have a tendency to lean to the right or the left.

The structure of PROCtree is very simple and calls PROCtree within itself in a FOR loop that controls the particular number of branches drawn at any level. The parameter 'rand' controls the selection of one out of two PROCtree calls and you can observe from the program the way in which the parameters are randomly perturbed.

This article is the second in a series of four adapted by Stephen Maddock from The Art of Microcomputer Graphics for the BBC Micro/Electron. *The book, by Jim McGregor and Alan Watt, is published by Addison-Wesley Publishers Ltd. See page 87 for details of how to send for the book and associated software* Graphito and Tesselator.

Turn to yellow page 111 for Jim McGregor and Alan Watt's listings

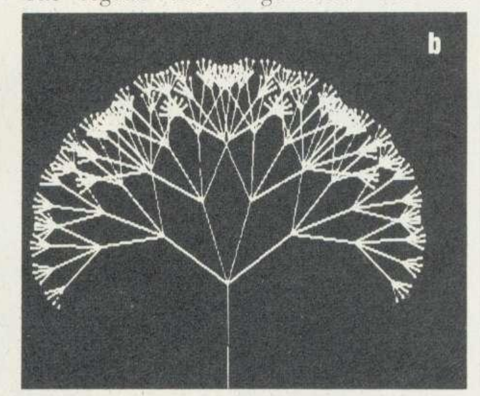




Figure 7. Two pairs of regular and randomised tree shapes. (a) and (c) are regular tree shapes with the randomising parameters set to 0, in (b) and (d) it is set to 1. The other five parameters are identical in each pair

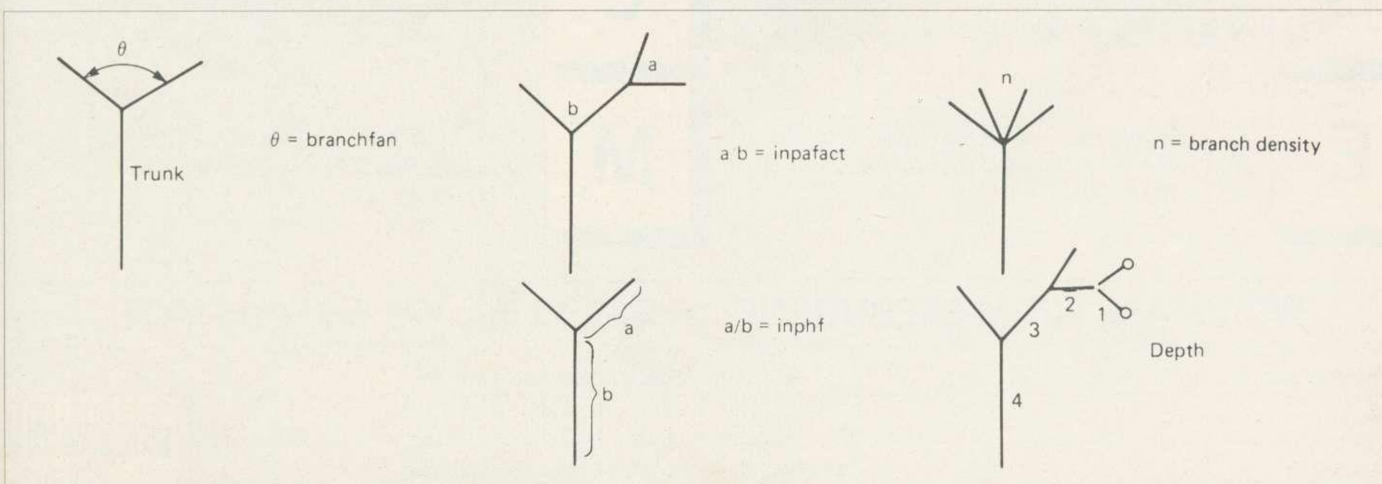
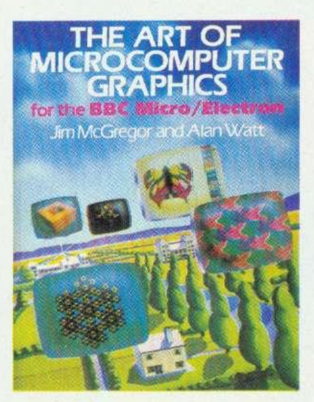


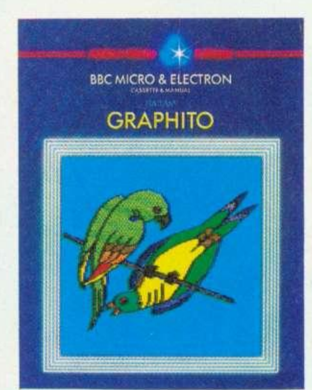
Figure 8. Five design parameters for recursive trees. These control the overall shape of the tree. You can elaborate on the program by adding more parameters

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To accompany this series, *Acorn User* is making the book and programs developed from it available to readers – just complete and post the coupon below.

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SPACE SAVER

Would you like to reduce the space needed to save the contents of high resolution screens? With this data compression program you can cut the memory used by more than half

David Pilling

This article describes a simple data compressor that can be incorporated into the BBC micro or Electron disc or tape filing system. It adds a new star command to your micro's vocabulary – when it's entered it will save the contents of the current screen in a compressed form, cutting the space required on tape or disc by more than half. A complementary command allows screens to be uncompressed and displayed in the normal form. These high resolution screens can be text or graphics and usually occur in modes 0,1,2,4 or 5.

An important use of computers is the storage of information. However, often more information than necessary is held which leads to a corresponding wastage of time and space, because the data being stored has redundancies in it, for example, unnecessary spaces. By coding it, these can be removed and the information kept in less space. This process is called data compression.

One of the first uses of computers was to process financial data, and it was soon realised that many financial documents contained large numbers of blank characters and strings of zeros. By implementing a data compression scheme to remove these, storage space could be saved.

From this beginning, a number of standard coding techniques have been developed. Some of them are as follows:

a) Diatomic In English certain pairs of letters occur more often than others: by using spare character codes (the complete ASCII set only occupies numbers 0 to 127 while computers usually handle data as bytes) to represent these combinations, text can be compressed.

b) Null Supression Here the data to be compressed contains one character which is repeated often (usually the space character). This method works by replacing multiple repetitions of the character by a special code followed by the number of times the character was repeated.

c) Run Length This is very similar to b) except that now multiple repetitions of any character are replaced by a sequence of a special character, the character to be repeated and then the number of repetitions.

d) Tokenising Here, character sequences which are often repeated are replaced by spare codes. This technique is used in most microcomputer Basic systems for the storage of keywords: END, FOR, etc . . . On the BBC micro and Electron, character codes between 128 and 255 all correspond to a Basic keyword. The number for a keyword is called its token.

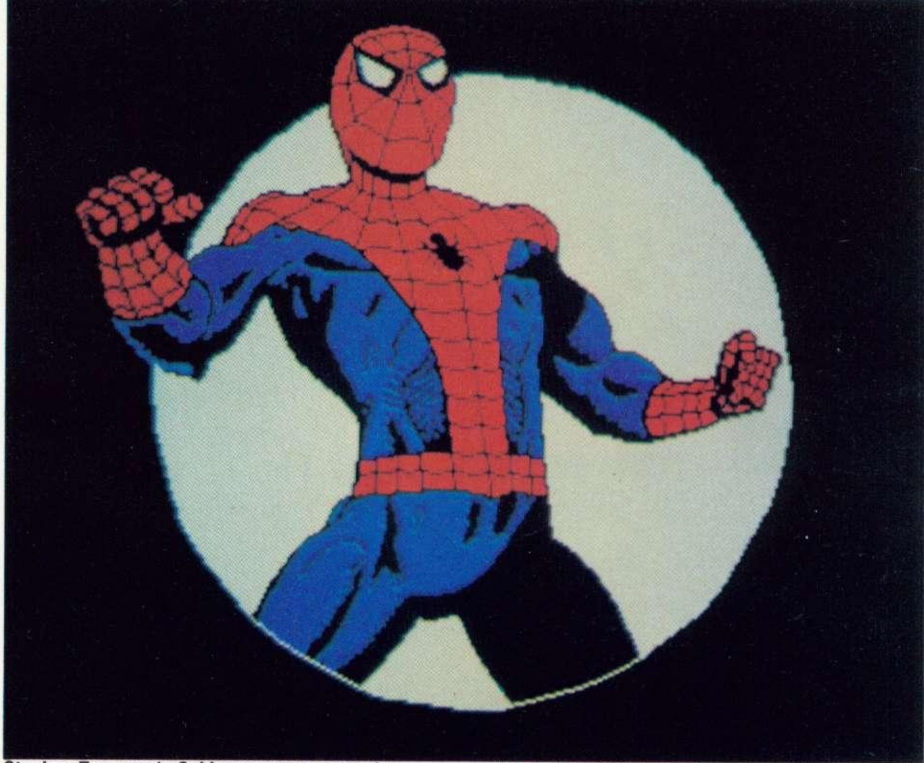
e) Bit Map In this technique, when some data is stored, a block of bytes is kept with it which contains a bit for each byte in the original data. A set bit means that a byte is a repetition of the previous one. Repeated bytes are, of course, not stored.

f) Variable Length Codes In the familiar ASCII code, the codes for each character are of the same length (7 bits). Clearly, less space would be taken up if the letters which occur most frequently had shorter codes (eg, 4 bits). A simple example of this type of code is morse code. (Care must be taken, though, to ensure that a short code does not look like the beginning of a long one: there's a technique called Huffman coding which, given the relative frequencies with which characters occur, states how to construct the optimum variable length code.)

g) Half Byte In this, a special character is used to signify that the data following it is packed two characters to the byte. Data in such a form obviously represents a limited number of characters so a typical use of this technique would be to compress text which contains strings of numbers.

Very often the results of a program are displayed on one of the high resolution screens. When you want to save them the usual method is to *SAVE an area of memory corresponding to the screen.

Although this is very effective, it involves storing much more information than necessary because most screen pictures will involve large



Stephen Townrow's Spiderman screen can be compressed to fit into 7867 bytes from over 20k

areas of the same colour. Saving every single byte in such an area is very inefficient and what is required is a form of data compression.

Considering the techniques described above, run length coding would seem to be appropriate. However, the bytes in the screen take on the full range of values between 0 and 255. This means there is no special code available to signify that a number of bytes are to be repeated so a variation on ordinary run length coding is needed.

The method used here is to insert an extra byte every so often in the data being saved. This is split into two fields: the bottom five bits give the number of bytes (less one) to be read without change and the top three bits give the number of times that the last byte read is to be repeated.

Listing 1 on yellow page 114 is the data compressor system. Type in the program and save it. After the usual debugging process, running the program will set up the compressor. Once this has been done, another * command will have been added to the usual repertoire of the computer: *D+ will switch the data compressor on and *D– will switch it off. After a *D+ all data which is transferred to a file via the BPUT command will be compressed and data coming into the computer via BGET will be expanded. There are some limitations on the use of the compressor – only one channel can be used for input and one for output while the compressor is on. In addition, a *D– should be done before closing a file to flush the compressor buffer.

Implementing a data compressor on an Acorn micro is made easy by the use of vectors for all interaction with the filing system. It intercepts the three vectors of the operating system command line interpreter (OSCLI) BGET and BPUT. When the program is run, these vectors will be reset to point into the assembled piece of machine code. This means that the program must not be run twice without resetting the vectors by pressing Break and then typing OLD. If the program is run more than once, a message will be given saying that the vectors do not have legitimate values and so the system will not work.

On a tape system the compressor takes up just under 256 bytes and so can be accommodated in a single page, page C (the character definitions). The address at which the code is assembled is determined by the value given to the variable 'start' in line 60. Full details on how to enter the listing for tape and disc use can be found on the yellow pages.

Listing 2 is a typical example of how to use the data compressor and it consists of three procedures. PROCpattern displays a simple pattern on the screen, PROCsave saves this in compressed form (note the use of *D in lines 20220 and 20080).

Saving a mode screen usually requires 10240 bytes; for the pattern produced by this program, only around 3000 bytes are needed for the compressed form. In other words, you save by a factor of three in loading time for a cassette system or get a factor of three increase in the number of screens that can be saved on a single disc – the actual saving will depend on the particular screen saved, with a typical figure being between 10 and 50 per cent.

The procedures PROCload and PROCsave in listing 2 are general and can be added to any graphics program – to do this, take your copy of the listing and delete lines 10 to 310. The resulting program, which consists of the two procedures, can then be saved. If you want to add data compression to a graphics program, this new file can be merged with it in one of the usual ways (see 'merging' in the User Guide).

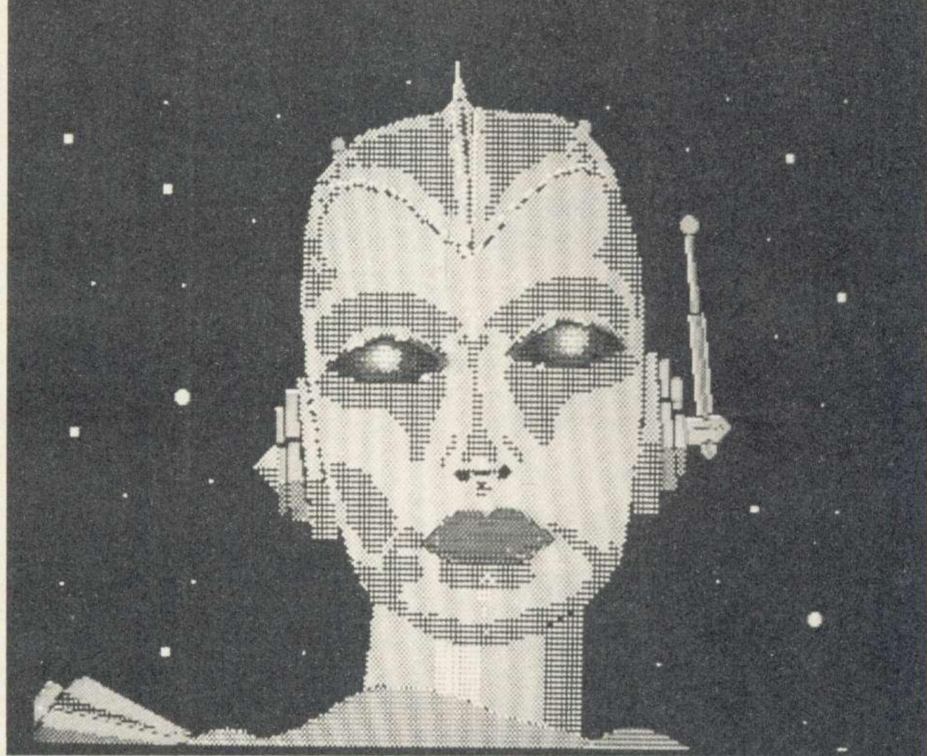
As an example of this process. I'll describe how to add data compression to Rob Fenton's excellent drawing program in the February 1985 issue of *Acorn User*. First, load the *Paintbox* program and then merge it with your file containing PROCload and PROCsave. Next, delete lines 1680 to 1745 of *Paintbox* (the ordinary *save-type procedures used for storing screens). Finally, save the new program. In future, before using *Paintbox*, the program in listing 1 must be run to set up the data compressor. In addition, care should be taken not to press Break while using the program as this will reset the filing system vectors. However, all images saved or loaded by the new program will be in compressed form.

The output of any graphics program can be compressed. All you have to do is to merge the two procedures (PROCload and PROCsave) with it and then insert a call of PROCsave at the point where the image you want to save is on the screen. A call, PROCload, can then be used from within the same or a different program to restore the image to the screen from disc or tape.

PROCload and PROCsave could be improved by replacing the string 'SCREEN' (lines 360 and 490) with a string variable supplied by the program to which they are added. Doing this would allow screens to be kept with different names. The best way of storing pictures is to keep the commands that generated them. To give a trivial example, a completely blank mode 5 screen requires 10240 bytes if *saved but only one byte if the command CLS is stored. When it's impossible to keep track of these commands saving the screen memory is most efficient.

The data compressor can be used on data of any type, although for it to be of any value the data must contain redundancies of the type mentioned, ie, repetition of certain characters. Program files (for instance) are a case where this type of data compression is of no use. Most of the redundancy has been taken out by tokenising – better candidates would be text files with lots of spaces.

David Pilling's two data compression listings are on yellow pages 114-116



Brilliance by Malcolm Banthorpe can only be reduced from 20k to 10786 bytes as it contains lots of detail

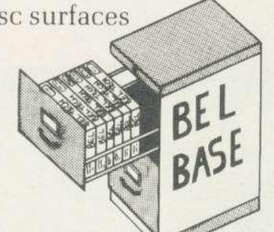
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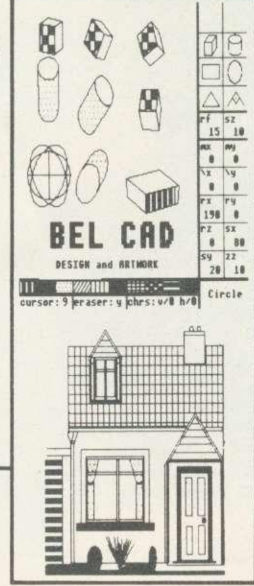
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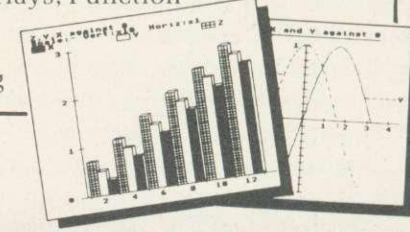
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COMPETITION

SIX OF THE BEST

Solve six challenges to win one of five Challengers

Simon Dally

This month there are six problems for you to mull over. You could win one of five Opus Challenger 3s worth nearly £250 each. This 5.25in disc drive with built-in double density disc interface plus a 256K RAM disc offers an easy disc upgrade for the BBC micro.

1) Five members of a computer club decided to pool their resources at the computer show at Olympia which opened on Tuesday and closed on Saturday. Each already owned a computer and agreed to make a close inspection of another one on display. Each visited the show on a different day of the week.

Richard went to examine the Amiga. His visit was two days earlier than that of the member with a Commodore 64. Julian found it difficult to drag himself away from his Spectrum, as did the Amstrad owner. It wasn't Julian or George who inspected the 32016 processor on Tuesday. The BBC micro owner inspected the Macintosh whereas Henry looked at something else on the Saturday. Mark visited the show the day before the person who looked at the latest IBM lookalike whereas the Apple owner went on the Thursday. The person who saw the Atari ST was impressed. Who owned which machine, on which day did he visit the show and which machine did he inspect?

2) My Beeb has five ROM sockets laid out in a row. To save my failing eyesight I've colour-coded each chip. The chip in the middle slot is orange. The DFS is not one of the end chips. *View* is somewhere to the left of the OS and immediately to the right of the purple chip. The red chip isn't *Communicator*. The green chip is one to the left of the yellow one. Basic is not on the far right while *View* is to the right of the DFS.

What is the configuration of my ROM?

3) In the *Acorn User* dungeon turmoil has been created by the new rating system. Previously all dwarfs paid their rates in the form of an exact number of Quinns – the same number as there are trolls in the dungeon. The trolls paid nothing – and of course lied about having paid their rates when the inspectors came round.

Under the new system all rates are paid in Somerens, a Quinn being an exact number of Somerens. Every dungeon dweller now – both dwarf and troll – has to pay the same number of Somerens as the combined number of dwarfs and trolls in the dungeon.

The interesting thing is that under this new system the total amount collected (a five-figure number of Somerens using standard dungeon decimal notation) is just one Someren less than the most collected under the previous rating system.

How many Somerens make a Quinn?



We've got five Opus Challenger 3s as prizes, so if you want an easy disc upgrade for the Beeb, you could be lucky.

In the puzzles below each letter stands for a different (base 10) digit. Different letters represent different digits.

4) ABCDEFGC + CGFEDCBA = BD9GGG90D. If A*B = 8 what is ABCDEFG?

5) ADDD, AACA, BCDB and BDAC are all prime numbers. What are they?

6)

```
   SEVEN
 + SEVEN
 +   SIX
 -------
  TWENTY
```

What is the välue of each letter?

Answers on a postcard or back of an envelope to December Competition, Acorn User, 68 Long Acre, London WC2E 9JH, to arrive not later than 3 Janauary 1985.

You must include the coupon printed on this page with your entry or you'll be disqualified – stick it on your postcard or envelope. A photocopy will not be accepted.

AUGUST WINNERS

The August competition attracted around 450 entries, about 70 per cent correct. One (or unity) is not usually accepted as a prime but this is by no means universal and one diligent reader triumphantly dug up a three-year-old issue of *Acorn User* to show that we had referred to one as a prime! I'm afraid a schizophrenic decision had to be made here. If you take one to be a prime then the highest superprime is 1,979,339,339. If not, then 73,939,133 was correct. Both those answers were accepted.

However, one was not acceptable as the answer to question three.

We were looking for 1549 as the answer. Those who wrote saying one fits the bill or that we hadn't excluded negative powers were entered for the draw provided they came up with 1549 as well.

As has been said before, using rigorous mathematical language in the context of a puzzle puts off many readers and when in doubt use your common sense. By all means state valid alternatives if you think you have them but don't imagine we're trying to trick you! Frankly, it may please you to point out that since Base 10 or something else wasn't specified your solution is quite valid, but we don't set out to be 'sneaky' to you and you should look for the most reasonable solution first of all.

The answer to the question of the largest cyclic prime was an unequivocal 999, 331 and the anagram of CARTHORSE cracked by the Hacker was ORCHESTRA.

The winner of the Cumana disc drive was James Lindsay of Newbury, Berkshire. Second prize of a Cumana touch pad went to Collette Saxton of Sheffield.

The three runners-up, who each receive a box of Cumana discs, were Douglas Shaw of Glasgow, Mrs M Kitt from Glamorgan and Sue Miller, who lives in West Germany.

ACORN USER COMPETITION DECEMBER

THE GENERATION GAME

Would you like to use more than the BBC micro or Electron's normal character set on screen, but can't spare the ROM sockets or the cash? Well, this font generator program could be your answer

Matthew Cook

Have you ever found you are bored with looking at the Beeb's and Electron's straight, plain, character set? Have you ever wished you could do what some of these special ROMs do, but can't because you haven't any spare ROM sockets or can't afford it? Well, now you can smarten up your characters with this program, called *FONT.

By building up different font files with the Font Generator program and saving them on disc (tape users should see the notes on yellow page 116), you can load in the fonts at any time by just typing, for instance, *FONT ITALICS or *FONT BOLD. This will change the current character set for all subsequent screen output. The different sets can be conjured up at will, and without affecting either the text or graphics cursor, so that you can mix, say, bold, italic and normal print on one line. If you join the cursors with a VDU 5 command, you can

Different sets can be conjured up at will, without affecting either text or graphics cursor

even put the text anywhere on the screen (to within one pixel), which is especially useful when labelling graphs.

An added feature of this program is that you can superimpose one font on another, or even add such things as the French acute accent, the German umlaut, etc. This is very easy to do: you select VDU 5; redefine the '@' character to an acute accent (or whatever); MOVE the graphics cursor to the appropriate position; PRINT the text up to and including the acuted character; type in 'VDU 8' and finally PRINT an '@' followed by the rest of the line.

The programs that make up the *FONT series are: Font Generator – the program that converts the normal character set into italics or bold, etc, and stores them on disc; Font Source – the program that makes *FONT; *FONT – the actual machine code program; and Demo, a demonstration program.

This is how the program works: type *FONT ITALICS (or bold, modern, etc). The operating system (OS) first interprets the *

An added feature of this program is that you can superimpose one font on another

command, and checks to see if it recognises it. It doesn't, so it asks the other ROM (not Basic) if they know anything about it. They don't, so the current disc is catalogued. If FONT (the rest of the command is ignored at this stage) is on the disc, it is loaded into pages &9 and &A. Then it is executed from &900, and *FONT begins. The first thing that *FONT does is to see if the italic (or bold, etc) file is on the disc. If it is, it redefines the characters according to the information on the file. Then, all you need do is take the computer out of mode 7 and you will find that you are in your selected font.

To build the *FONT program, first type in the Font Generator which is the program to generate and save the font files which you want. Then save it as "FONTGEN" and run it. You will be confronted by a line of characters, with a number in the middle. This is the ASCII (American Standard Code for Information Interchange) number for the present character to be edited. Press the space bar, alter the character as directed by the menu, and when you are satisfied, press R (redefine) and the character will be permanently changed. If you make a mess of it and want to start again, press space and you will find yourself back at the main menu, with the character unchanged. (If you want a quicker way of changing to a different font, selecting various options from the menu lets you play around with the current character and make it do such things as change to italics, or bold, or both.)

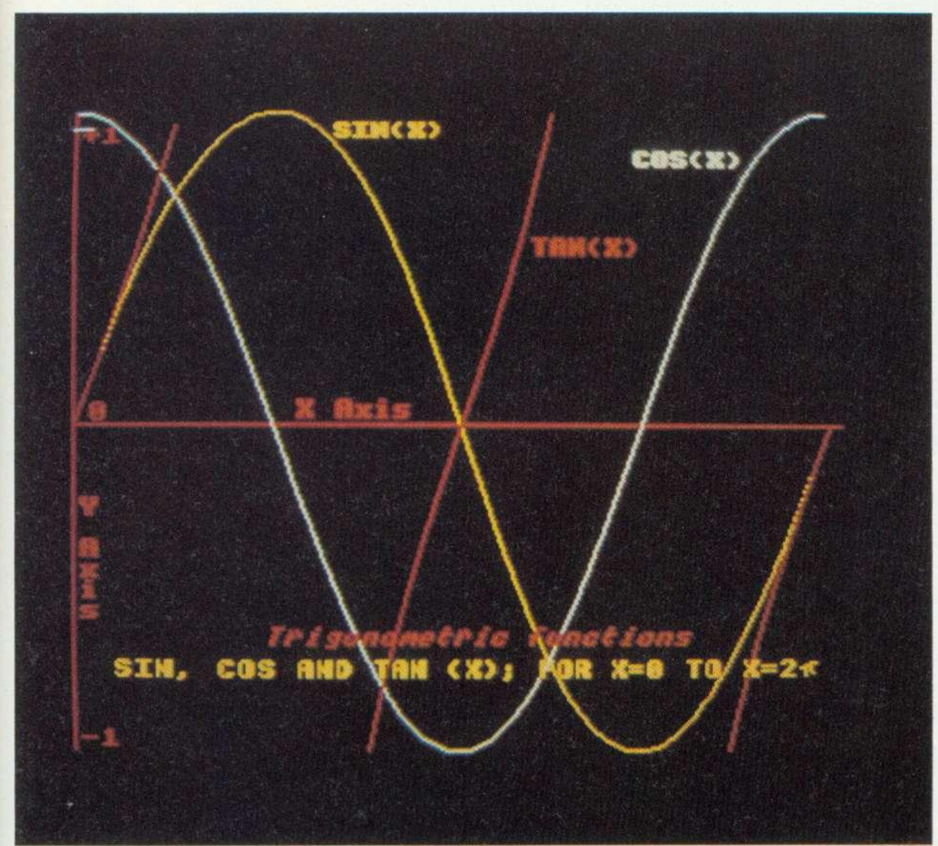
One interesting feature of this program is that it works with the current character set and not the normal one. This means that you could change a character into bold, then make it italic, and then invert it (changing the black to white and the white to black).

If you don't want to go through the whole thing 26 times, make the present character 'A',

10-80	Sets up main variables
90-160	Prints main character list
170-190	Instructions
200-340	Detects which keys have been pressed
350-390	Makes an array of present character
410-430	Colour and x, y offsets
440-500	Prints a larger version of character in array
510-750	Secondary menu
760-810	Redefines character according to array
820-900	Procedures for binary conversion
910-1330	Various procedures
1340-1620	Font procedures
1630-1820	Multiple font procedure

Figure 1. Line explanations

select the <Zap 26 characters> option, and choose which of the fonts you want. The program will then run through the character set, changing it all to the requested font. This part of the program is quite slow as the procedures that contain the algorithms take a comparatively long time to execute (of course this only has to be done once for each font). When it has finished, you will find yourself



The demonstration program draws and labels a graph with sine, cosine and tangent lines

back at the original menu. This will now look strange as it's in a different font to when you last saw it.

Look through the character set with the cursor keys and you will probably find some you aren't quite happy with. Don't panic – press the space bar and edit the character until it looks right.

Then press R and you will see the character suitably adjusted. Continue pressing the space bar and doing the same to the other characters that don't look right. When you have finished all this, move on to the lower-case characters. When you have finished the whole character set, or done as much as you want, select the SAVE option, and save it to disc.

Since there will be several other programs and fonts that will need to be on the same disc, make sure that there is plenty of spare catalogue/disc space available.

Now that you have one font on the disc you are using, you can move on to the program that actually loads the font in. Type in the program called Font Source, and *save it before running it* – this is essential to avoid erasing the source program. Saving it will enable you to load it back in if anything goes wrong.

When you have saved it, run it. Some machine code and some numbers should appear on the screen. If at the bottom of the screen there is a message saying that you have made a mistake, go through the listing and check that you have typed in everything *exactly* as it appears. If you are sure that you have, and it still says that there is an error, look at the error-checking routine, and make sure that any messages in it are typed in *exactly* as they appear, because if just one letter is incorrect, a checksum error will still occur.

When everything works the program will prompt you to save the completed machine code to disc – its filename should be FONT. When all this is done, switch off the computer to stop it 'cheating', and switch it on again.

It works with the current character set and not the normal one

Then type MODE
ITALICS (or whichev
the disc). The disc-dr
should get the promp
text will now be in itali
selected. Now go bac
and make up the other
save them, and test th
MODERN, etc.

It should be noted at
at the end of this artic
character set (done aut
does require some spac
set &600 higher than u

If PAGE is normally
fitted), then you should set it to &1F00; if it is normally &1B00, set it to &2100. To find out what PAGE is in your micro, type PRINT ~ PAGE. This will return a value, to which you will have to add &600. PAGE can then be reset by typing PAGE= <new number> (you must remember, though, that this is hex number addition!).

If this is not done, the lowest &600 bytes of the current program will be destroyed, resulting in the dreaded 'Bad Program' error.

You may also like to try the demonstration program, which draws and labels a graph, with sine, cosine and tangent lines.

It should be noted that there is a bug in the 0.90 Acorn DFS which is *not* present in the newer DNFS (see the yellow pages for more information on this).

Bits: Puts the present character in to the character array (B)
Prin: Prints out the contents of the array (character definition) to the screen
Alter: Adjusts present character according to keypresses
Replace: Redefines the character according to the array
Bin, Seg, Hex, Seg2, Hex2: Parts of the binary to decimal converter
Save: Saves the current font
Load: Loads a new font with *FONT program
Sl, Sr: Shift left and shift right of present line (secondary menu)
G: Puts the specified line (array) into the returned string
Italic, Bold, Inverse, Modern: Font adjustments on the present character
Wipe: Wipes the present character array (secondary menu)
Zap: Changes the font of the next 26 characters

Figure 2. What the procedures do

FOOTNOTE: In normal circumstances it is only possible to define ASCII characters 128 to 159 – the definitions for



even put the text anywhere on the screen (to within one pixel), which is especially useful when labelling graphs.

An added feature of this program is that you can superimpose one font on another, or even add such things as the French acute accent, the German umlaut, etc. This is very easy to do: you select VDU 5; redefine the '@' character to an acute accent (or whatever); MOVE the graphics cursor to the appropriate position; PRINT the text up to and including the acuted character; type in 'VDU 8' and finally PRINT an '@' followed by the rest of the line.

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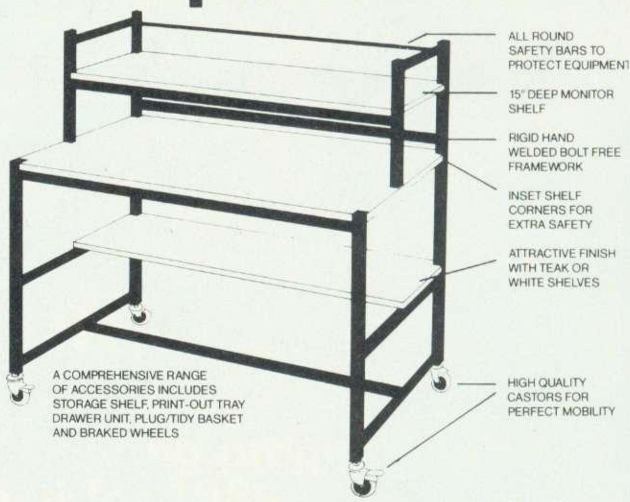
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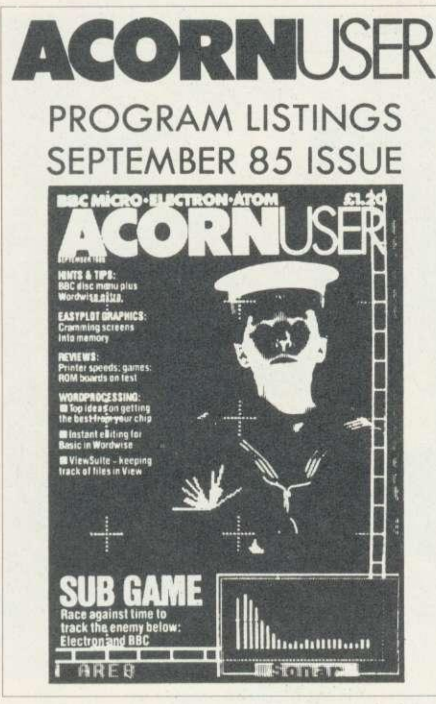
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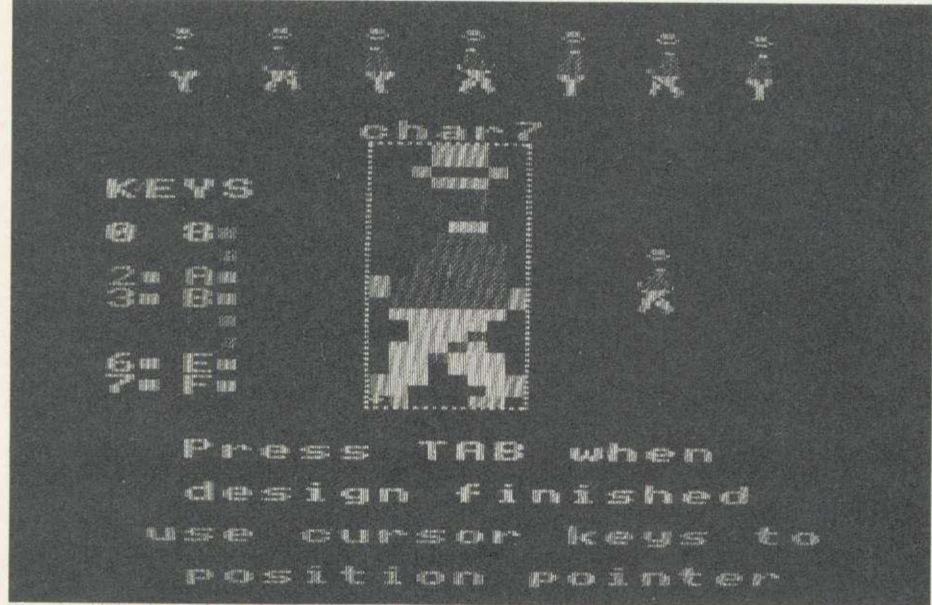
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This sprite designer is just one of the popular Acorn User graphics programs now available on one cassette

Four of the most popular and useful graphics programs that we've presented in *Acorn User* – Rob Fenton's *Paintbox*, Peter Sandford's *Colfill* and *Dotfill* and Harry Sinclair's Sprite designer – are now available on one cassette, suitable for use with the BBC micro or Electron, competitively priced at £3.95.

Paintbox, (February 1985), offers you a wide palette of facilities – airbrushing, drawing circles and squares, colour filling, colour mixing and textured effects – and it's fast!

Peter Sandford's *Dotfill* and *Colfill* (January and February 1985) allow you to produce bar charts, pie charts, maps, etc, with up to 28 coloured fill patterns and 24 tone patterns, and to mix foreground and background colours. The routines are easily incorporated into your own programs.

The final suite of programs is Harry Sinclair's Sprite designer from the September, October and November 1984 issues of *Acorn User*. It lets you design full-colour cartoon figures quickly, then edit, clone or mirror them and move them around the screen – an indispensible aid to all aspiring games authors.

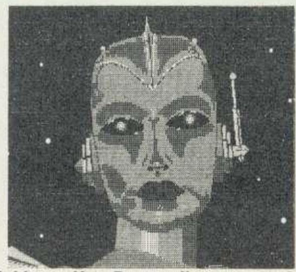
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***JDUMP**	colour dump for the JX80 printer
***WINDOW**	defines a graphics window from the keyboard
***TRANSTT**	converts a teletext screen into mode 1
***RTT**	restores a teletext screen after *TRANSTT
***LPRINT**	directs all PRINT commands to the printer only
***LPOFF**	cancels*LPRINT
***C@**	sets up CTRL @ option
***SET**	sets the printer text style
***RESET**	turns off the effect of *SET
***MAR**	sets either printer margin
***SHIFT**	shifts an area of memory
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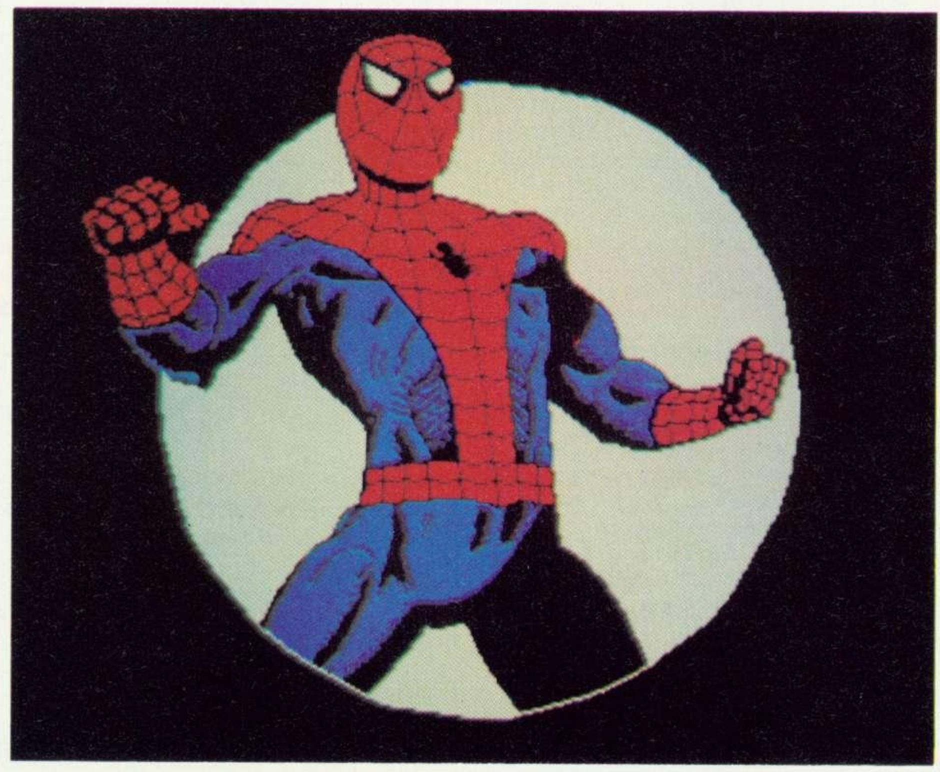
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This month's program listings cassette features a font generator, a screen compressor, McGregor and Watt's recursion programs and a fun game – *Shuggy's Garden*. There is a disc version of the December program listings available at £5.75 which also includes the Spiderman screen (from page 89) and recursive tree screens. Plus we can still supply the October and November discs.

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YELLOW PAGES

HINTS & TIPS

INDEX PROGRAM		Page	BBC B	BBC B+	BBCB+128k	6502SP	Electron	Monthly cassette
Hints & Tips	Listing 1-2	105	Y	Y	Y	Y	Y	Y
	Listing 3-4	106	Y	Y	Y	Y		
First Byte	Listing 1	106	Y	Y	Y		Y	Y
Shuggy's Garden	Listing 1	107	Y	Y	Y*		Y	Y(a)
	Listing 2-3	108	Y	Y	Y*		Y	Y
Fractals and Recursion	Listing 1-2	111	Y	Y	Y	Y	Y	Y
	Listing 3-4	113	Y	Y	Y	Y	Y	Y
Data Compressor	Listing 1	114	Y	Y	Y	Y	Y	Y
	Listing 2	116	Y	Y	Y	Y	Y	Y
Font Generator	Listing1	117	Y	Y	Y	Y	Y	Y
	Listing 2	118	Y	Y	Y	Y	Y	Y
	Listing 3	120	Y	Y	Y	Y	Y	Y

Note: (a) Sideways RAM required; (*) With Shadow RAM off.

Enter listings

Where possible, programs are listed with line numbers in increments of 10. With these listings, simply type AUTO <RETURN> before you begin. This will give automatic line numbering. Don't type a space after the line number. To list your program so it appears identical to the printed version in the magazine, type: LISTO 1 <RETURN> WIDTH 40 <RETURN> LIST <RETURN>

With screen models 1,4,6 or 7, WIDTH 40 is not needed. Note that occasionally, for clarity, programs are listed with a text width different to our standard of 40 characters.

Most typing mistakes in Basic will cause error messages when the program is run. Finding errors in assembly language listings is often harder, so we provide checksums where we can. These are small routines which report any mistakes in assembled machine-code. In the August issue of *Acorn User* we published a program for calculating checksums for Basic programs. See page 109 for details of our monthly Basic checksum sheets.

Hints & Tips, see page 48

Listing 1. Program to choose 'random' letter

```
   10 REM Select a letter
   20 REM by Martin Phillips
   30 REM for BBC B/B+ and Electron
   40 REM (c) Acorn User December 1985
   50 :
   60 MODE 2
   70 PROCsetscreen
   80 PROCrun
   90 PROCend
  100 END
  110 :
  120 DEF PROCsetscreen
  130 PRINT''"Guess the letter"
  140 FOR Y=128 TO 384 STEP 256
  150 FOR X=0 TO 1192 STEP 120
  160 GCOL 0,128+RND(6)
  170 VDU 24,X;Y;X+120;Y+128;
  180 VDU 16,26
  190 MOVE X,Y:DRAW X,Y+128
  200 NEXT X
  210 MOVE 1200,Y:DRAW 1200,Y+128
  220 NEXT Y
  230 FOR Y=128 TO 512 STEP 128
  240 MOVE 0,Y:DRAW 1200,Y
  250 NEXT Y
  260 VDU 5:GCOL 3,2
  270 FOR N=0 TO 19
  280 MOVE 120*(N MOD10)+32,200+256*(N D
IV 10)
  290 PRINT CHR$(65+N)
  300 NEXT N
  310 ENDPROC
  320 :
  330 DEF PROCrun
  340 A$="ABCDEFGHIJKLMNOPQRST"
  350 count=0:test=21
  360 REPEAT
  370 REPEAT
  380 letter$=CHR$(GET AND 95)
  390 position=INSTR(A$,letter$)
  400 UNTIL position>0
  410 count=count+1
  420 N=position-1
```

Continued ▶

◀ Continued

```
  430 MOVE 120*(N MOD10)+32,200+256*(N D
IV 10)
  440 PRINT CHR$(65+N)
  450 A$=LEFT$(A$,position-1)+"~"+RIGHT$
(A$,20-position)
  460 SOUND 1,-5,position*8,5
  470 IF count=10 THEN PROCrnd
  480 UNTIL position=test
  490 ENDPROC
  500 :
  510 DEF PROCend
  520 FOR N=0 TO 200 STEP 8
  530 SOUND 1,-5,N,2
  540 NEXT N
  550 VDU 4
  560 ENDPROC
  570 :
  580 DEF PROCrnd
  590 Z=RND(-TIME)
  600 REPEAT
  610 test=RND(20)
  620 UNTIL MID$(A$,test,1)<>"~"
  630 ENDPROC
```

Listing 2. Routine for drawing a solid polygon

```
   10 REM VDU problems
   20 REM by Martin Phillips
   30 REM for BBC B/B+ and Electron
   40 REM (c) Acorn User December 1985
   50 :
   60 MODE 4
   70 VDU 19,0,4,0,0,0
   80 PROCpolygon(5)
   90 END
  100 :
  110 DEF PROCpolygon(N)
  120 startx=512:X=startx
  130 starty=256:Y=starty
  140 size=1500/N
```

Continued ▶

First Byte, see page 53

◀ Continued

```
150 angle=2*PI/N
160 FOR I=0 TO N
170 MOVE startx,starty
180 MOVE X,Y
190 X=X+size*COS(I*angle)
200 Y=Y+size*SIN(I*angle)
210 PLOT 85,X,Y
220 NEXT I
230 ENDPROC
```

Listing 3. This procedure prints a heart

```
10 REM Epson bit image
20 REM by Martin Phillips
30 REM for BBC B/B+ and Electron with
Plus 1
40 REM (c) Acorn User December 1985
50 :
60 VDU 2
70 PRINT"Heart ";
80 PROCheart
90 VDU 3
100 END
110 :
120 DEF PROCheart
130 VDU 1,27,1,75,1,8,1,0
140 VDU 1,48,1,120,1,126,1,63
150 VDU 1,126,1,120,1,48,1,0
160 ENDPROC
```

Listing 4. Draws a dual-density heart

```
10 REM Epson dual-density bit image
20 REM by Martin Phillips
30 REM for BBC B/B+ and Electron with
Plus 1
40 REM (c) Acorn User December 1985
50 :
60 VDU 2
70 PRINT"Heart ";
80 PROCheart
90 VDU 3
100 END
110 :
120 DEF PROCheart
130 VDU 1,27,1,76,1,16,1,0
140 VDU 1,48,1,48,1,120,1,120
150 VDU 1,126,1,126,1,63,1,63
160 VDU 1,126,1,126,1,120,1,120
170 VDU 1,48,1,48,1,0,1,0
180 ENDPROC
```

First Byte, see page 53

How to enter *BEEP

Type in and save the program as normal – see the notes on the first yellow page for guidance. Save the program under a suitable filename, ie, SAVE "SBEEP".

Now run the program, correcting any errors that are reported. If the machine code assembles correctly, it will then be checked by the program. If it is incorrect the message "Listing error" will be reported. If this happens then check carefully through lines 90 to 800. Correct the error(s) and resave the program before running it again. When the machine code is correct it will be saved automatically under the name BEEP, so make sure you have a tape or disc ready.

To load the program into sideways RAM follow the instructions provided in your sideways RAM manual.

*If you have an Acorn User UserRAM, you can load the new *BEEP routine into the sideways RAM by using the *RLOAD facility supplied on the utilities disc. Full instructions are provided in the UserRAM manual.*

*Once loaded press the Break key to initialise the program. Typing *HELP should display the Help messages from all your ROMs including First Byte! Type *BEEP to hear the effect.*

Listing 1. Program for use in sideways RAM

```
10 REM Implement *BEEP
20 REM by Tessie Revivis
30 REM for BBC B/B+ and Electron
40 REM with Sideways RAM
50 REM (c) Acorn User December 1985
60 :
70 MODE 6
80 osnewl=&FFE7
90 diff%=&3000
100 comline=&F2
110 :
120 FOR pass=0 TO 3 STEP 3
130 P%=&5000
140 [
150 OPT pass
160 BRK
170 BRK
180 BRK
190 JMP service_entry+diff%
200 OPT FNequb(&82,pass)
210 OPT FNequb((offset MOD 256),pass)
220 OPT FNequb(1,3)
230 .title
240 OPT FNequs("First Byte 1.00",pass)
250 BRK
260 .offset
270 BRK
280 OPT FNequs("(C) Acorn User",pass)
290 BRK
300 .service_entry
310 PHA
320 CMP #9
330 BEQ help
340 CMP #4
350 BEQ unrec
360 PLA
370 RTS
380 .help
390 JSR osnewl
400 LDX #&FF
410 .helploop
420 INX
430 LDA title+diff%,X
440 JSR &FFE3
450 BNE helploop
460 JSR osnewl
```

Continued ▶

Shuggy's Garden, see page 73

◀ Continued

```
 470 RTS
 480 :
 490 .unrec
 500 TYA
 510 PHA
 520 TXA
 530 PHA
 540 LDX #&FF
 550 DEY
 560 .ctloop
 570 INY
 580 INX
 590 LDA table+diff%,X
 600 BMI found
 610 CMP (comline),Y
 620 BEQ ctloop
 630 JMP out+diff%
 640 .found
 650 LDA #7
 660 JSR &FFEE
 670 PLA
 680 PLA
 690 PLA
 700 LDA #0
 710 RTS
 720 .out
 730 PLA
 740 TAX
 750 PLA
 760 TAY
 770 PLA
 780 RTS
 790 .table
 800 OPT FNequs ("BEEP",pass)
 810 OPT FNequb (255,pass)
 820 ]
 830 NEXT
 840 PROCchecksum
 850 *SAVE BEEP 5000 5072 8000 8000
 860 END
 870 :
 880 DEF FNequb(byte%,opt)
 890 ?P%=byte%
 900 P%=P%+1
 910 =opt
 920 :
 930 DEF FNequs(string$,opt)
 940 $P%=string$
 950 P%=P%+LEN(string$)
 960 =opt
 970 :
 980 DEF PROCchecksum
 990 C%=0
1000 FOR N%=&5000 TO P%
1010 C%=C%+?N%
1020 NEXT
1030 IF C%<>12679 PRINT"Listing error":
END
1040 ENDPROC
```

Shuggy's Garden, see page 73

How to enter Shuggy's Garden

Shuggy's Garden *is in three parts. Listing 1 should be typed in first and saved on tape or disc with the name "SHUGGYS". When you have done this delete listing 1 from the memory by typing NEW <Return> and then type in listing 2. This is just a short loading routine and should be saved with the name "LOADER". If you are using a cassette-based system then ensure that "LOADER" is saved immediately after "SHUGGYS".*

Finally, type in listing 3. This is the main game and should be saved with the name "GARDEN". The listing is long so you should save what you have typed in at regular intervals. "GARDEN" contains two small sections of assembly language – lines 370 to 440 and lines 530 to 610. If you are unfamiliar with assembly language don't worry – just type in these lines exactly as they are printed.

"GARDEN" also contains quite a lote of data for the graphics and tune used in the game. If the message "Out of data" appears when you run the game then the chances are that you have missed out a ',' in one of the DATA statements. Take care not to type extra commas, also. Any errors that are made in the data lines will not be fatal, although the tune or characters may be corrupted.

Once you have saved "GARDEN" simply type CHAIN "SHUGGYS" <Return> to run the game. Again, "GARDEN" should be saved immediately after "LOADER" if you are using cassettes. To escape from "GARDEN" press Shift and Escape together. Note that if you have a disc-based system you will be unable to recover "GARDEN" with OLD after pressing Break.

Shuggy's Garden *will run on both cassette and disc-based machines and is suitable for both the BBC micro and Electron, without alterations.*

Listing 1. Determines the character cursor position

```
  10 REM Shuggys
  20 REM by Hugh Darby
  30 REM for BBC B/B+ and Electron
  40 REM (c) Acorn User December 1985
  50 :
  60 MODE 6
  70 VDU 23,225,170,85,170,85,170,85,17
0,85
  80 VDU 23,226,85,170,85,170,85,170,85
,170
  90 VDU 23,227,0,0,255,255,0,0,255,255
 100 VDU 23,228,255,255,0,0,255,255,0,0
 110 VDU 23,229,204,204,204,204,204,204
,204,204
 120 VDU 23,230,51,51,51,51,51,51,51,51
 130 VDU 23,231,255,129,129,129,129,129
,129,255
 140 VDU 23,232,0,0,0,24,24,0,0,0
 150 VDU 23,233,51,51,48,48,63,63,0,0
 160 VDU 23,234,0,0,63,63,48,48,51,51
 170 VDU 23,235,0,0,252,252,12,12,204,2
04
 180 VDU 23,236,204,204,12,12,252,252,0
,0
 190 ENVELOPE 1,2,-1,1,-1,0,0,0,126,126
,-3,-3,120,120
 200 ENVELOPE 2,1,-1,1,-1,-4,-4,-4,0,0,
-1,-1,126,126
 210 ENVELOPE 3,1,-1,-1,-1,4,4,4,-1,-1,
1,1,126,126
 220 PRINT TAB(12,7)"Shuggy's Garden"
 230 VDU 28,10,17,30,15
 240 PAGE=&5000:CHAIN"LOADER"
```

Listing 2. Prints multi-coloured characters on screen

```
   10 REM Loader
   20 REM by Hugh Darby
   30 REM for BBC B/B+ and Electron
   40 REM (c) Acorn User December 1985
   50 :
   60 *L. GARDEN 1B00
   70 *T.
   80 *K.0 VDU12,21|MFORd%=0TO&1F00S.4:d
%!&E00=d%!&1B00:N.|MPA.=&E00|MO.|MRUN|F|
M
   90 *FX 138,0,128
  100 END
```

Listing 3. Sets up the game

```
   10 REM Garden
   20 REM by Hugh Darby
   30 REM for BBC B/B+ and Electron
   40 REM (c) Acorn User December 1985
   50 :
   60 ON ERROR GOTO300
   70 MODE 1
   80 PROCassem:PROCarray
   90 REPEAT
  100 PROCvar:PROChi
  110 MODE 2
  120 REPEAT PROCscreen
  130 *FX 178
  140 REPEAT
  150 FOR loop%=0 TOno%
  160 PROCplayer:PROCmonster:PROCapsc
  170 PROCapple:PROCmushroom:PROCblock
  180 fin%=(A%=app%)
  190 IF fin% OR dead% loop%=no%
  200 IF ADVAL(-6)=15 PROCtune
  210 NEXT
  220 UNTIL dead% OR fin%
  230 *FX 178,255
  240 IF dead% PROCfinish ELSE PROCnewsc
r
  250 UNTIL dead%
  260 MODE 1:PROCend
  270 UNTIL 0
  280 END
  290 :
  300 IF INKEY(-1) CLS:PRINT"OK":END
  310 RUN
  320 :
  330 DEF PROCassem
  340 FOR pass=0 TO 3 STEP 3
  350 P%=&80
  360 [
  370 OPT pass
  380 LDA #135
  390 JSR &FFF4
  400 TXA
  410 CLC
  420 ADC #96
  430 STA &70
  440 RTS
  450 ]
  460 NEXT pass
```

Continued ▶

◀ Continued

```
  470 DIM mcode 15:data=&900
  480 FOR Q%=0 TO 127:READ Q%?data:NEXT
  490 FOR Q%=128 TO 159:Q%?data=0:NEXT
  500 FOR pass=0 TO 3 STEP 3
  510 P%=mcode
  520 [
  530 OPT pass
  540 .code
  550 LDY #31
  560 .loop
  570 LDA (&74),Y
  580 STA (&70),Y
  590 DEY
  600 BPL loop
  610 RTS
  620 ]
  630 NEXT pass
  640 ENDPROC
  650 :
  660 REM Graphics data
  670 DATA 0,0,5,5,0,0,0,0
  680 DATA 5,15,11,15,5,5,5,15
  690 DATA 15,15,11,15,5,5,5,5
  700 DATA 0,10,15,15,0,0,0,10
  710 DATA 0,0,0,20,20,20,0,60
  720 DATA 0,40,60,48,144,60,40,40
  730 DATA 0,20,60,48,96,60,20,20
  740 DATA 0,0,0,40,40,40,0,60
  750 DATA 0,0,1,3,3,3,1,0
  760 DATA 15,5,3,3,3,3,3,3
  770 DATA 15,0,3,3,23,43,3,3
  780 DATA 10,0,2,3,3,3,2,0
  790 DATA 0,0,1,23,3,0,0,0
  800 DATA 0,3,23,3,23,5,5,5
  810 DATA 0,3,3,23,3,10,10,10
  820 DATA 0,0,2,3,3,0,0,0
  830 :
  840 DEF PROCarray
  850 DIM H%(5),H$(5)
  860 FOR Q%=1 TO 5
  870 H$(Q%)="Shuggy OK"
  880 H%(Q%)=12000-2000*Q%
  890 NEXT Q%
  900 ENDPROC
  910 :
  920 DEF PROCvar
  930 scr%=1:A%=0:LI%=3:SC%=0:ti%=26
  940 so%=-1:sh%=data:mo%=data+32
  950 ap%=data+64:mu%=data+96
  960 bl%=data+128
  970 ENDPROC
  980 :
  990 DEF PROChi
 1000 CLS
 1010 PRINT TAB(9,5)"Today's Top Shuggys
"
 1020 FOR Q%=1 TO 5
 1030 COLOUR2:PRINT TAB(8,2*Q%+9);Q%
 1040 COLOUR1:PRINT TAB(11,2*Q%+9);H%(Q%
)
 1050 COLOUR3:PRINT TAB(20,2*Q%+9)H$(Q%)
 1060 NEXT
 1070 PRINT TAB(8,28)"Press any key to p
lay"
 1080 U=GET
 1090 ENDPROC
```

Continued ▶

◀ Continued

```
 1100 :
 1110 DEF PROCcent(A$)
 1120 pos=20-LEN(A$)/2
 1130 PRINT TAB(pos,VPOS)A$
 1140 ENDPROC
 1150 :
 1160 DEF PROCscreen
 1170 RESTORE 4060
 1180 CLS:COLOUR 3
 1190 VDU 23;8202;0;0;0;:VDU 19,9,2;0;
 1200 A$=CHR$(234)+STRING$(17,CHR$(227))
 1210 B$=CHR$(233)+STRING$(17,CHR$(228))
 1220 PRINT TAB(0,0)A$ TAB(0,21)B$
 1230 FOR Q%=1 TO 20
 1240 VDU 31,0,Q%,230,31,18,Q%,229
 1250 NEXT Q%
 1260 VDU 31,18,0,235,31,18,21,236
 1270 COLOUR 9
 1280 PROCgrass
 1290 PROCpath
 1300 PRINT TAB(1,24)"SCORE:"
 1310 PRINT TAB(1,26)"LIVES:"
 1320 PRINT TAB(1,28)"SCREEN:"
 1330 PRINT TAB(1,30)"APPLES:"
 1340 PROCvar2:PROCupdate
 1350 ENDPROC
 1360 :
 1370 DEF PROCpath
 1380 ON scr% GOTO 1390,1400,1410,1420
 1390 PROCpath1:ENDPROC
 1400 PROCpath2:ENDPROC
 1410 PROCpath3:ENDPROC
 1420 PROCpath4
 1430 ENDPROC
 1440 :
 1450 DEF PROCpath1
 1460 FOR Q%=1 TO 20:VDU 31,10,Q%,32:NEX
T
 1470 FOR Q%=7 TO 13:VDU 31,Q%,20,32:NEX
T
 1480 VDU 31,7,7:FOR Q%=0 TO 2
 1490 VDU 32,8,11,32,8,11,32
 1500 NEXT Q%
 1510 ENDPROC
 1520 :
 1530 DEF PROCpath2
 1540 FOR Q%=2 TO 16:VDU 31,Q%,19,32:NEX
T
 1550 FOR Q%=5 TO 14:VDU 31,Q%,4,32:NEXT
 1560 VDU 31,2,18,32,31,2,17,32,31,2,16
 1570 VDU 32,31,2,15,32,31,2,14,32
 1580 VDU 31,2,13,32,32,32,8,11,32,32
 1590 VDU 32,8,11,32,32,32,32,32,32,32
 1600 VDU 8,11,32,32,32,8,11,32,32,8,11
 1610 VDU 32,8,11,32,8,11,32,8,8,8,11
 1620 VDU 32,32,32,31,3,5,32,32,8,11,32
 1630 ENDPROC
 1640 :
 1650 DEF PROCpath3
 1660 FOR Q%=3 TO 16:VDU 31,Q%,20,32:NEX
T
 1670 FOR Q%=4 TO 16:VDU 31,Q%,2,32:NEXT
 1680 FOR Q%=10 TO 16:VDU 31,Q%,10,32:NE
XT
 1690 FOR Q%=1 TO 7
 1700 VDU 31,17,Q%+2,32,31,17,Q%+10,32
```

Continued ▶

◀ Continued

```
 1710 NEXT
 1720 VDU 31,1,19,32,32,8,10,32
 1730 VDU 31,16,19,32,32,31,17,18,32,31
 1740 VDU 16,3,32,31,16,11,32,8,11,11
 1750 VDU 32,31,3,3,32,32
 1760 ENDPROC
 1770 :
 1780 DEF PROCpath4
 1790 FOR Q%=1 TO 20:VDU 31,10,Q%,32:NEX
T
 1800 FOR Q%=3 TO 14:VDU 31,Q%,15,32:NEX
T
 1810 VDU 31,3,15:FOR Q%=0 TO6
 1820 VDU 32,8,11,32,8,11,32
 1830 NEXT Q%
 1840 ENDPROC
 1850 :
 1860 DEF PROCvar2
 1870 fin%=0:dead%=0:x%=10:y%=20
 1880 ax%=RND(16):ay%=RND(20)
 1890 L%=0:P=-1:nx%=x%:ny%=y%:co%=0
 1900 mad%=0:no%=5-scr%:app%=5+3*scr%
 1910 mx%=10:my%=10
 1920 ENDPROC
 1930 :
 1940 DEF PROCupdate
 1950 COLOUR 1
 1960 PROCscore:PROClives:PROCapp
 1970 t%=6-((ti%-1)/5)
 1980 PRINT TAB(8,28);t%;"/";scr%
 1990 ENDPROC
 2000 :
 2010 DEF PROCplayer
 2020 PROCpr(0)
 2030 ox%=x%:oy%=y%
 2040 PROCkeys:PROCch2:PROCpr(1)
 2050 ENDPROC
 2060 :
 2070 DEF PROCkeys
 2080 IF INKEY(-98) AND x%>1 x%=x%-1:END
PROC
 2090 IF INKEY(-67) AND x%<17 x%=x%+1:EN
DPROC
 2100 IF INKEY(-105) AND y%<20 y%=y%+1:E
NDPROC
 2110 IF INKEY(-73) AND y%>1 y%=y%-1
 2120 IF INKEY(-17) so%=0
 2130 IF INKEY(-82) so%=-1
 2140 IF INKEY(-56) REPEAT UNTIL INKEY(-
55)
 2150 ENDPROC
 2160 IF INKEY(-56) REPEAT UNTIL GET=79
 2170 DEF PROCch2
 2180 char=FNcheck(x%,y%)
 2190 IF x%=mx% AND y%=my% dead%=-1:ENDP
ROC
 2200 IF char=225 SC%=SC%+1:PROCscore:EN
DPROC
 2210 IF char=226 x%=ox%:y%=oy%:ENDPROC
 2220 IF x%=ax% AND y%=ay% PROCgotapp:EN
DPROC
 2230 IF x%=10 AND y%=10 PROCmad
 2240 ENDPROC
 2250 :
 2260 DEF PROCgotapp
 2270 P=0:SC%=SC%+100:A%=A%+1
```

Continued ▶

◀ Continued

```
2280 PROCapple:PROCscore:SOUND1,1,200,1
2290 VDU17,1,31,ox%,oy%,226
2300 ENDPROC
2310 :
2320 DEF PROCmad
2330 IF mad% ENDPROC
2340 mad%=-1:SC%=SC%+1000
2350 PROCsound:PROCscore
2360 ENDPROC
2370 :
2380 DEF PROCpr(C)
2390 !&70=&3000+x%*&20+y%*&280
2400 IF C PROCs ELSE PROCb
2410 ENDPROC
2420 :
2430 DEF FNcheck(q%,r%)
2440 VDU 31,q%,r%:CALL&80
2450 =?&70
2460 :
2470 :
2480 DEF PROCapple
2490 !&70=&3000+ax%*&20+ay%*&280
2500 IF P PROCa:ENDPROC
2510 PROCb
2520 ax%=RND(16):ay%=RND(20):PROCapp
2530 IF (ax%=mx% AND ay%=my%) OR (ax%=x
% AND ay%=y%) OR (ax%=nx% AND ay%=ny%) O
R (ax%=10 AND ay%=10) PROCapple
2540 P=-1:PROCapple
2550 ENDPROC
2560 :
2570 DEF PROCblock
2580 L%=NOT L%:co%=co%+1
2590 IF co%<>ti% GOTO 2630
2600 VDU 17,1,31,nx%,ny%,226
2610 IF nx%=x% AND ny%=y% dead%=-1:ENDP
ROC
2620 nx%=x%:ny%=y%:co%=0
2630 VDU 17,1,31,nx%,ny%,231-L%
2640 ENDPROC
2650 :
2660 DEF PROCmonster
2670 IF loop%<>1 ENDPROC
2680 PROCpm(0)
2690 ox%=mx%:oy%=my%:PROCmove
2700 PROCch:PROCpm(1)
2710 ENDPROC
2720 :
2730 DEF PROCmove
2740 IF mx%<x% mx%=mx%+1:ENDPROC
2750 IF mx%>x% mx%=mx%-1:ENDPROC
2760 IF my%<y% my%=my%+1:ENDPROC
2770 IF my%>y% my%=my%-1
2780 ENDPROC
2790 :
2800 DEF PROCpm(C)
2810 !&70=&3000+mx%*&20+my%*&280
2820 IF C=0 PROCb ELSE PROCm
2830 ENDPROC
2840 :
2850 DEF PROCch
2860 IF mad% VDU 17,1,31,ox%,oy%,226
2870 IF mx%=ax% AND my%=ay% PROCmonapp
2880 IF mx%=x% AND my%=y% dead%=-1
2890 ENDPROC
2900 :
```

Continued ▶

◀ Continued

```
2910 DEF PROCmonapp
2920 P=0:SC%=SC%-100:A%=A%-2
2930 SOUND 1,1,0,1:PROCapple:PROCscore
2940 ENDPROC
2950 :
2960 DEF PROCapsc
2970 IF SC%<0 SC%=0:PROCscore
2980 IF A%<0 A%=0:PROCapp
2990 ENDPROC
3000 :
3010 DEF PROCapp
3020 PRINT TAB(8,30);A%;"/";app%;SPC(2)
3030 ENDPROC
3040 :
3050 DEF PROCscore
3060 COLOUR 1:PRINT TAB(7,24);SC%;SPC(3
)
3070 ENDPROC
3080 :
3090 DEF PROCfinish
3100 SOUND 1,2,0,1
3110 LI%=LI%-1:IF LI%>=0 dead%=0
3120 ENDPROC
3130 :
3140 DEF PROCnewscr
3150 A%=0:scr%=scr%+1:IF scr%>4 PROCti
3160 PROCvar2
3170 ENDPROC
3180 :
3190 DEF PROCti
3200 scr%=1:ti%=ti%-5
3210 IF ti%<1 ti%=1
3220 ENDPROC
3230 :
3240 DEF PROCmushroom
3250 !&70=&4A40
3260 IF mad% ENDPROC ELSE PROCr
3270 ENDPROC
3280 :
3290 DEF PROCsound
3300 VDU 19,9,5;0;
3310 FOR Q%=0 TO255 STEP4
3320 SOUND 1,3,Q%,.9:SOUND 0,3,Q%,.9
3330 NEXT Q%
3340 FOR Q%=255 TO80 STEP -90
3350 SOUND 1,2,Q%,1
3360 NEXT Q%
3370 ENDPROC
3380 :
3390 DEF PROClives
3400 PRINT TAB(7,26)SPC(3):!&70=&71E0
3410 IF LI%=0 ENDPROC
3420 Q%=1:REPEAT
3430 PROCs:Q%=Q%+1:!&70=!&70+&20
3440 UNTIL Q%>LI%
3450 ENDPROC
3460 :
3470 DEF PROCs:!&74=sh%:CALLcode:ENDPRO
C
3480 :
3490 DEF PROCm:!&74=mo%:CALLcode:ENDPRO
C
3500 :
3510 DEF PROCa:!&74=ap%:CALLcode:ENDPRO
C
3520 :
```

Continued ▶

McGregor & Watt, see page 82

◀ Continued

```
3530 DEF PROCr: !&74=mu%:CALLcode:ENDPRO
C
3540 :
3550 DEF PROCb: !&74=bl%:CALLcode:ENDPRO
C
3560 :
3570 DEF PROCend
3580 VDU23;8202;0;0;0;:*FX21,0
3590 IF SC%<=H%(5) ENDPROC
3600 FOR Q%=5 TO1 STEP-1
3610 IF H%(Q%)<SC% C%=Q%
3620 NEXT Q%
3630 CLS
3640 PROCcent("WELL DONE!!!")
3650 PRINT'''
3660 PROCcent("Your score of "+STR$(SC%
))
3670 PRINT'
3680 B$=MID$(" stndrdthth",C%*2,2)
3690 PROCcent("ranks you "+STR$(C%)+B$)
3700 PRINT'
3710 PROCcent("Enter your name")
3720 A$=FNinput(17)
3730 IF C%=5 GOTO3770
3740 FOR Q%=4 TOC% STEP-1
3750 H%(Q%+1)=H%(Q%):H$(Q%+1)=H$(Q%)
3760 NEXT Q%
3770 H%(C%)=SC%:H$(C%)=A$
3780 ENDPROC
3790 :
3800 DEF FNinput(up)
3810 A$=""
3820 REPEAT
3830 A=GET
3840 IF A=127 A$=LEFT$(A$,LENA$-1)
3850 IF FNvalid(A) AND LEN(A$)<20 A$=A$
+CHR$(A)
3860 PRINT TAB(0,up)SPC(40);TAB(0,up-1)
3870 PROCcent(A$)
3880 UNTIL A=13
3890 =A$
3900 :
3910 DEF FNvalid(A)
3920 =((A>64 AND A<91) OR (A>96 AND A<1
23) OR A=32)
3930 :
3940 DEF PROCtune
3950 IF so%=0 ENDPROC
3960 READ N,D:IF N=0 RESTORE 4060:N=1
3970 IF N=1 SOUND 1,0,0,2:ENDPROC
3980 SOUND 1,1,N-48,D*2
3990 ENDPROC
4000 DEF PROCgrass
4010 FOR Y% = 1 TO 20
4020 PRINT TAB(1,Y%)STRING$(17,CHR$225)
4030 NEXT:ENDPROC
4040 :
4050 REM Tune data
4060 DATA 101,2,117,2,129,2,129,4,177,2
4070 DATA 177,2,1,1,165,2,165,2,1,1
4080 DATA 101,2,101,2,117,2,129,2,129,4
4090 DATA 177,2,177,2,1,1,169,2,169,2
4100 DATA 1,1,97,2,97,2,109,2,137,2
4110 DATA 137,4,185,2,185,2,1,1,169,2
4120 DATA 169,2,1,1,97,2,97,2,109,2
4130 DATA 137,2,137,4,185,2,185,2,1,1
```

Continued ▶

◀ Continued

```
4140 DATA 165,2,165,2,1,1,101,2,101,2
4150 DATA 117,2,129,2,149,4,197,2,197,2
4160 DATA 1,1,177,2,177,2,1,1,101,2
4170 DATA 101,2,117,2,129,2,149,4,197,2
4180 DATA 197,2,1,1,185,2,185,2,1,1
4190 DATA 157,2,157,2,169,2,185,2,185,8
4200 DATA 173,2,177,2,213,8,197,2,165,2
4210 DATA 165,4,157,2,185,4,177,2
4220 DATA 149,12,0,0
```

McGregor & Watt, see page 82

How to enter McGregor and Watt's listings

All four listings are written only in Basic, so should be straightforward to type in. Because of the large amount of data used in listings 2 and 3, however, a checksum routine has been included. If you have made a mistake typing in the data lines an error message will appear, prompting you to check your listing.

No alterations are required to run the programs on an Electron, B+ or B+128k.

Listing 1. Generates a random fractal curve

```
10 REM Program 1 - a simple fractal
20 REM by Jim McGregor and Alan Watt
30 REM for BBC B/B+ and Electron
40 REM (c) Acorn User December 1985
50 :
60 MODE 0
70 resolution=10
80 ressq=resolution*resolution
90 maxtheta=40
100 PROCfractal(450,500,830,500)
110 K=GET:MODE 7:END
120 DEF PROCfractal(x1,y1,x2,y2)
130 LOCAL xdiff,ydiff,xdir,ydir,mx,my
140 xdiff=x2-x1:ydiff=y2-y1
150 IF xdiff*xdiff+ydiff*ydiff<=ressq
THEN MOVE x1,y1:DRAW x2,y2:ENDPROC
160 theta=maxtheta-RND(2*maxtheta)
170 sinth=SINRADtheta
180 costh=COSRAD(theta)
190 xdir=xdiff/2/costh
200 ydir=ydiff/2/costh
210 mx=x1+xdir*costh-ydir*sinth
220 my=y1+xdir*sinth+ydir*costh
230 PROCfractal(x1,y1,mx,my)
240 PROCfractal(mx,my,x2,y2)
250 ENDPROC
```

Listing 2. Gives successive fractal curves

```
   10 REM Program 2 - coastline
   20 REM by Jim McGregor and Alan Watt
   30 REM for BBC B/B+ and Electron
   40 REM (c) Acorn User December 1985
   50 :
   60 PROCcheckdata
   70 maxtheta=40
   80 DIM sin(maxtheta),cos(maxtheta)
   90 FOR a=0 TO maxtheta
  100 sin(a)=SIN(RAD(a))
  110 cos(a)=COS(RAD(a))
  120 NEXT a
  130 resolution=12
  140 ressq=resolution*resolution
  150 maxstep=50
  160 MODE 0
  170 RESTORE
  180 READ plotop,x,y
  190 prevx=x:prevy=y
  200 MOVE prevx,prevy
  210 REPEAT
  220 READ plotop,x,y
  230 IF plotop=5 THEN PROCjoin(prevx,pr
evy,x,y)
  240 prevx=x:prevy=y
  250 UNTIL (x=470) AND (y=431)
  260 END
  270 :
  280 DEF PROCjoin(prevx,prevy,nextx,nex
ty)
  290 LOCAL xdiff,ydiff,steps,xstep,yste
p,s,x,y
  300 xdiff=nextx-prevx
  310 ydiff=nexty-prevy
  320 steps=INT(SQR(xdiff*xdiff+ydiff*yd
iff)/maxstep)+1
  330 xstep=xdiff/steps
  340 ystep=ydiff/steps
  350 FOR s=1 TO steps
  360 x=prevx+xstep:y=prevy+ystep
  370 PROCfractal(prevx,prevy,x,y)
  380 prevx=x:prevy=y
  390 NEXT s
  400 ENDPROC
  410 DEF PROCfractal(x1,y1,x2,y2)
  420 LOCAL xdiff,ydiff,mx,my,theta,s,c,
c2,cs
  430 xdiff=x2-x1:ydiff=y2-y1
  440 IF xdiff*xdiff+ydiff*ydiff<ressq T
HEN MOVE x1,y1:DRAW x2,y2:ENDPROC
  450 theta=maxtheta-RND(2*maxtheta)
  460 IF theta<0 THEN sinth=-sin(-theta)
:costh=cos(-theta) ELSE sinth=sin(theta)
:costh=cos(theta)
  470 xdir=xdiff/2/costh
  480 ydir=ydiff/2/costh
  490 mx=x1+xdir*costh-ydir*sinth
  500 my=y1+xdir*sinth+ydir*costh
  510 PROCfractal(x1,y1,mx,my)
  520 PROCfractal(mx,my,x2,y2)
  530 ENDPROC
  540 DATA 4,569,823,5,659,820
  550 DATA 5,656,799,5,611,757
  560 DATA 5,622,757,5,605,732
  570 DATA 5,642,742,5,705,738
  580 DATA 5,717,717,5,668,634
  590 DATA 5,642,623,5,660,626
```

Continued ▶

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```
  600 DATA 5,672,613,5,631,595
  610 DATA 5,663,595,5,692,580
  620 DATA 5,716,551,5,737,468
  630 DATA 5,791,421,5,802,379
  640 DATA 5,780,384,5,802,362
  650 DATA 5,813,333,5,797,314
  660 DATA 5,810,305,5,818,320
  670 DATA 5,866,315,5,881,294
  680 DATA 5,874,242,5,851,216
  690 DATA 5,819,192,5,864,180
  700 DATA 5,864,159,5,800,125
  710 DATA 5,743,126,5,677,124
  720 DATA 5,627,130,5,580,88
  730 DATA 5,534,99,5,492,73
  740 DATA 5,467,83,5,540,160
  750 DATA 5,560,175,5,625,173
  760 DATA 5,647,208,5,610,191
  770 DATA 5,580,210,5,555,210
  780 DATA 5,560,217,5,545,225
  790 DATA 5,519,216,5,502,243
  800 DATA 5,519,252,5,566,270
  810 DATA 5,575,308,5,575,325
  820 DATA 5,540,317,5,573,352
  830 DATA 5,594,359,5,619,362
  840 DATA 5,634,366,5,629,378
  850 DATA 5,642,391,5,636,396
  860 DATA 5,636,409,5,649,427
  870 DATA 5,638,434,5,628,426
  880 DATA 5,610,463,5,633,501
  890 DATA 5,589,488,5,572,499
  900 DATA 5,570,479,5,551,496
  910 DATA 5,547,479,5,531,508
  920 DATA 5,567,553,5,531,588
  930 DATA 5,520,543,5,503,538
  940 DATA 5,529,648,5,490,630
  950 DATA 5,523,699,5,523,761
  960 DATA 5,575,825,4,511,819
  970 DATA 5,496,771,5,469,756
  980 DATA 5,465,766,5,472,773
  990 DATA 5,466,795,5,510,818
 1000 DATA 4,444,754,5,465,751
 1010 DATA 5,446,703,5,442,705
 1020 DATA 5,443,728,5,442,749
 1030 DATA 4,469,431,5,473,336
 1040 DATA 5,449,274,5,385,271
 1050 DATA 5,279,230,5,229,278
 1060 DATA 5,229,303,5,279,331
 1070 DATA 5,323,382,5,261,414
 1080 DATA 5,284,477,5,354,468
 1090 DATA 5,377,494,5,351,506
 1100 DATA 5,373,519,5,379,541
 1110 DATA 5,432,552,5,472,539
 1120 DATA 5,504,497,5,511,454
 1130 DATA 5,470,431
 1140 :
 1150 DEF PROCcheckdata
 1160 ON ERROR IF ERR=42 GOTO 1220 ELSE
CLS:REPORT:PRINT" at line ";ERL:END
 1170 total%=0
 1180 FOR x%=1 TO 357
 1190 READ k%:total%=total%+k%
 1200 NEXT
 1210 IF total%=122772 ENDPROC
 1220 PRINT"Data error - please check li
sting"
 1230 END
```

Listing 3. Colour fills the map

```
   10 REM Program 3 - variations
   20 REM by Jim McGregor and Alan Watt
   30 REM for BBC B/B+ and Electron
   40 REM (c) Acorn User December 1985
   50 :
   60 PROCcheckdata
   70 RESTORE
   80 maxtheta=40
   90 DIM sin(maxtheta),cos(maxtheta)
  100 FOR a=0 TO maxtheta
  110 sin(a)=SIN(RAD(a))
  120 cos(a)=COS(RAD(a))
  130 NEXT a
  140 resolution=12
  150 ressq=resolution*resolution
  160 MODE 4
  170 PRINT TAB(1,1)"Fractal variations
on the shape of"TAB(15,2)"Britain"
  180 VDU 29,640;512;
  190 READ sections,startx,starty
  200 MOVE startx,starty
  210 FOR sect=1 TO sections
  220 READ centrex,centrey,points
  230 FOR p=1 TO points:READ x,y
  240 DRAW x,y:NEXT p
  250 NEXT sect
  260 FOR x=300 TO 900 STEP 600
  270 FOR y=300 TO 700 STEP 400
  280 RESTORE
  290 VDU 29,x;y;
  300 READ sections,prevx,prevy
  310 MOVE prevx,prevy:MOVE prevx,prevy
  320 FOR sect=1 TO sections
  330 READ centrex,centrey,points
  340 PLOT 85,centrex,centrey
  350 FOR p=1 TO points
  360 READ nextx,nexty
  370 PROCfractal(prevx,prevy,nextx,next
y)
  380 prevx=nextx:prevy=nexty
  390 NEXT p
  400 MOVE prevx,prevy
  410 MOVE centrex,centrey
  420 NEXT sect
  430 READ centrex,centrey
  440 PLOT 85,centrex,centrey
  450 NEXT:NEXT
  460 END
  470 DEF PROCfractal(x1,y1,x2,y2)
  480 LOCAL xdiff,ydiff,mx,my,theta,s,c,
c2,cs
  490 xdiff=x2-x1:ydiff=y2-y1
  500 IF xdiff*xdiff+ydiff*ydiff<ressq T
HEN MOVE x1,y1:MOVE centrex,centrey:PLOT
 85,x2,y2:ENDPROC
  510 theta=maxtheta-RND(2*maxtheta)
  520 IF theta<0 THEN sinth=-sin(-theta)
:costh=cos(-theta) ELSE sinth=sin(theta)
:costh=cos(theta)
  530 xdir=xdiff/2/costh
  540 ydir=ydiff/2/costh
  550 mx=x1+xdir*costh-ydir*sinth
  560 my=y1+xdir*sinth+ydir*costh
  570 PROCfractal(x1,y1,mx,my)
  580 PROCfractal(mx,my,x2,y2)
```

Continued ►

◄ Continued

```
  590 ENDPROC
  600 :
  610 DATA 8,-50,60
  620 DATA -25,75,5,-40,75,-30,90,-10
  630 DATA 90,-15,80,-20,70,-20,55,4
  640 DATA -7,70,5,70,-2,55,-10,40,0,0
  650 DATA 7,-5,30,0,20,5,10,10,0,15
  660 DATA -10, 20,-20, 25,-30,10,-50
  670 DATA 3,35,-30,50,-50,40,-65,20
  680 DATA -70,12,55,-70,35,-75,15,-80
  690 DATA -5,-85,-15,-87,-25,-90,-35
  700 DATA -93,-45,-95,-35,-87,-25,-80
  710 DATA -15,-72,-5,-65,10,-50,5,-17
  720 DATA -63,-30,-60,-25,-45,-20,-30
  730 DATA -10,-30,0,0,4,-12,-20,-15
  740 DATA -10,-18,0,-20,10,-20,55,4
  750 DATA -30,10,-30,30,-40,45,-50,60
  760 DATA -25,75
  770 :
  780 DEF PROCcheckdata
  790 ON ERROR IF ERR=42 GOTO 850 ELSE C
LS:REPORT:PRINT" at line ";ERL:END
  800 total%=0
  810 FOR x%=1 TO 117
  820 READ k%:total%=total%+k%
  830 NEXT
  840 IF total%=-836 ENDPROC
  850 PRINT "Data error - please check l
isting"
  860 END
```

Listing 4. Generates tree growth

```
   10 REM Program 4 - fractal trees
   20 REM by Jim McGregor and Alan Watt
   30 REM for BBC B/B+ and Electron
   40 REM (c) Acorn User December 1985
   50 :
   60 MODE 7
   70 PROCinitialise
   80 MODE 1:VDU 23,1,0;0;0;0;
   90 MOVE 640,100:GCOL 0,2
  100 PROCtree(angle,branchfan,height, d
epth%)
  110 END
  120 DEF PROCinitialise
  130 PRINT"Enter parameters :"''
  140 INPUT"rand : "rand
  150 INPUT"branchfan : "branchfan
  160 INPUT"inpafact : "inpafact
  170 INPUT"branchdensity : "branchdensi
ty
  180 INPUT"inphf : "inphf
  190 INPUT"depth% : "depth%
  200 angle=90:height=250
  210 ENDPROC
  220 DEF PROCtree(angle,branchfan,heigh
t,depth%)
  230 LOCAL i,x,y,start,theta,heightfact
or
  240 IF depth%=0 THEN GCOL 0,1:PLOT 65,
-2,0:PLOT 65,2,4:PLOT 65,2,-4:PLOT 0,-2,
0:GCOL0,2:ENDPROC
```

Continued ►

Data compressor program, see Techniques, page 89

◀ Continued

```
  250 start=angle-branchfan/2
  260 theta=branchfan/branchdensity
  270 IF depth% <= 2 THEN heightfactor=i
nphf/2 ELSE heightfactor=inphf
  280 x=height*COS(RAD(angle))
  290 y=height*SIN(RAD(angle))
  300 angle=start
  310 FOR i=1 TO branchdensity+1
  320 PLOT 1,x,y
  330 IF rand=0 THEN PROCtree(angle,bran
chfan*inpafact,height*heightfactor,depth
%-1):angle=angle+theta
  340 IF rand=1 THEN PROCtree(angle-thet
a/2+RND(theta),branchfan*inpafact,height
*heightfactor*(0.5+RND(1)/1.5),depth%-1)
:angle=angle+theta
  350 PLOT 0,-x,-y
  360 NEXT i
  370 ENDPROC
```

Data compressor program, page 89

How to enter Data Compressor

Enter the listing as normal and then save it to disc or tape. Once this has been performed run the program. Any errors will be reported.

If you get the message 'Checksum error' then you have made a mistake somewhere in the assembly listing, so re-check it.

If the message 'Invalid vectors' is printed at the end of the assembly listing, press the Break key, type OLD, press the Return key and re-run the program.

As listed, the program assembles into an awkward 257 bytes, so disc users cannot fit it neatly into a single page of memory (tape users can – see the notes below). It assembles from &900 to &A01 – if you need this area of memory you could use the top end of the function key buffer and the user definable character buffer. To do this, for example, change the &900 in line 60 to &BF0. Do this after you have run and checked the program otherwise the checksum will be different!

Tape Users

As mentioned above, tape users can fit the machine code into a page of memory, say from &C00 to &CFF. To do this, first enter and run the program as detailed above, correcting any errors. Once you have done this, delete lines 800 and 1180. Next delete line 110 and lines 2130 to 2210 inclusive, then resave the program.

Tape users should not attempt to use the program with the machine code assembled at either &900 or &A00.

Testing the compressor

Listing 2 is a simple test routine. Enter this as shown and save it to tape or disc under the filename DEMO. For the test you should not use a 6502 second processor or any shadow RAM as the demonstration peeks and pokes the screen directly.

Now hit the Break key, reload listing 1 and run this. Now reload DEMO – do not press the Break key. If you are using tape set it to Record; disc users should insert a suitable disc into the drive. Now type RUN. The screen will fill with a squared pattern which will be saved to tape or disc in a compressed form.

Once this has finished, the screen will clear and you will be requested to press the Return key. Tape users should rewind the tape to the beginning of the screen just saved. Press Return (press Play if you're using tape), and the screen will be reloaded.

If this all proceeds well, then the compressor is working fine and the 10k demo screen will have been saved in less than 3k!

Note that pressing Break will reset the bput and bget vectors, as will changing the filing system. You will need to re-run the first listing to reset them. If you anticipate hitting Break a few times it would be worth noting the new contents of the two vectors (ie, the contents of &216 to &219 inclusive) and resetting them 'by hand' on each occasion. To use the compressor on other screens, use the techniques given in listing 2, although you can, of course, get rid of the pattern drawing routine.

Listing 1. Data compressor program

```
  10 REM Data Compressor
  20 REM by D J Pilling
  30 REM BBC B/B+/B128/6502 and Electron
  40 REM (c) Acorn User December 1985
  50 :
  60 start=&900
  70 PROCsetup
  80 PROCassemble
  90 PROCvectors
 100 PROCend
 110 PROCchecksum
 120 END
 130 :
 140 DEFPROCsetup
 150 FOR L%=start TO (start+40)
 160 ?L%=0 : NEXT L%
 170 cliv=&208
 180 bgetv=&216
 190 bputv=&218
 200 clia=FNcalcvec(cliv)
 210 bgeta=FNcalcvec(bgetv)
 220 bputa=FNcalcvec(bputv)
 230 low=&70
 240 high=&71
 250 ENDPROC
 260 :
 270 DEF FNcalcvec(a%)=?a%+256*a%?1
 280 :
 290 DEF PROCassemble
 300 FOR pass=0 TO 3 STEP 3
 310 P%=start
 320 PROCvars
 330 [OPT pass
 340 .clix
 350 STX low
 360 STY high
 370 LDY #255
 380 :
 390 .s1
```

Continued ▶

```
 400 INY
 410 LDA (low),Y
 420 CMP #ASC"*"
 430 BEQ sl
 440 CMP #ASC"D"
 450 BNE exit
 460 INY
 470 LDA (low),Y
 480 CMP #ASC"+"
 490 BEQ don
 500 CMP #ASC"-"
 510 BEQ dof
 520 :
 530 .exit
 540 LDX low
 550 LDY high
 560 JMP clia
 570 :
 580 .don
 590 LDX #255
 600 STX write
 610 INX
 620 STX copy
 630 STX rep
 640 STX read
 650 INX
 660 STX of
 670 RTS
 680 :
 690 .dof
 700 LDA write
 710 BMI dofg
 720 JSR writebytes
 730 :
 740 .dofg
 750 LDA #0
 760 STA of
 770 RTS
 780 :
 790 .bputx
 800 STY channel
 810 LDX of
 820 BNE bp1
 830 JMP bputa
 840 :
 850 .bp1
 860 PHA
 870 LDX write
 880 BMI nw
 890 CMP last
 900 BNE df
 910 PLA
 920 INC copy
 930 LDA copy
 940 CMP #7
 950 BNE bgx
 960 JSR writebytes
 970 RTS
 980 :
 990 .df
1000 LDA copy
1010 BEQ nw
1020 JSR writebytes
1030 :
1040 .nw
1050 PLA
1060 STA last
1070 INX
```

Continued ▶

◀ Continued

```
1080 STX write
1090 STA buff,X
1100 CPX #31
1110 BNE bgx
1120 JSR writebytes
1130 :
1140 .bgx
1150 RTS
1160 :
1170 .writebytes
1180 LDY channel
1190 LDA copy
1200 ASL A
1210 ASL A
1220 ASL A
1230 ASL A
1240 ASL A
1250 ADC write
1260 JSR bputa
1270 LDX #0
1280 INC write
1290 :
1300 .wrb1
1310 LDA buff,X
1320 JSR bputa
1330 INX
1340 CPX write
1350 BNE wrb1
1360 LDX #0
1370 STX copy
1380 DEX
1390 STX write
1400 RTS
1410 :
1420 .bgetx
1430 LDA of
1440 BEQ bg1
1450 :
1460 .bg2
1470 DEC read
1480 BMI nor
1490 :
1500 .bg1
1510 JSR bgeta
1520 STA rbyte
1530 RTS
1540 :
1550 .nor
1560 DEC rep
1570 BMI norp
1580 LDA rbyte
1590 RTS
1600 :
1610 .norp
1620 JSR bgeta
1630 PHA
1640 AND #31
1650 TAX
1660 INX
1670 STX read
1680 PLA
1690 ROL A
1700 ROL A
1710 ROL A
1720 ROL A
1730 AND #7
```

Continued ▶

◄ Continued

```
 1740 STA rep
 1750 JMP bg2
 1760 :
 1770 ]
 1780 NEXT
 1790 ENDPROC
 1800 :
 1810 DEF PROCvars
 1820 of=FNV(1)
 1830 buff=FNV(32)
 1840 write=FNV(1)
 1850 copy=&72
 1860 last=&73
 1870 channel=&74
 1880 last=FNV(1)
 1890 rep=FNV(1)
 1900 read=FNV(1)
 1910 rbyte=FNV(1)
 1920 ENDPROC
 1930 :
 1940 DEF FNV(x%)
 1950 P%=P%+x%
 1960 =P%-x%
 1970 :
 1980 DEF PROCvectors
 1990 IF clia=clix OR bgeta=bgetx OR bput
a=bputx PRINT "Invalid vectors!":END
 2000 PROCD(cliv,clix)
 2010 PROCD(bgetv,bgetx)
 2020 PROCD(bputv,bputx)
 2030 ENDPROC
 2040 :
 2050 DEF PROCD(a,x)
 2060 ?a=x
 2070 a?1=x DIV256
 2080 ENDPROC
 2090 :
 2100 DEF PROCend
 2110 PRINT''"Data Compressor set up at &
";~start''"Length =&";~P%-start''
 2120 ENDPROC
 2130 :
 2140 DEF PROCchecksum
 2150 Z%=0
 2160 FOR N%=&900 TO &A00
 2170 Z%=Z%+?N%
 2180 NEXT
 2190 IF Z%=21315 THEN ENDPROC
 2200 VDU 7
 2210 PRINT"Checksum Error!"
```

Listing 2. Data compressor demonstration

```
   10 REM Data Compressor Demonstration
   20 REM by D J PIlling
   30 REM BBC B/B+/128k/6502 & Electron
   40 REM (c) Acorn User December 1985
   50 :
   60 MODE 5
   70 PROCpattern
   80 PROCsave
   90 CLS:*FX 21,0
  100 PRINT"PRESS RETURN TO"'"RESTORE SC
```

Continued ►

See Features, page 94

◄ Continued

```
REEN";
  110 REPEAT UNTIL GET=13:PRINT
  120 PROCload
  130 END
  140 :
  150 DEF PROCpattern
  160 VDU 19,0,4,0,0,0
  170 VDU 19,3,5,0,0,0
  180 VDU 23;8202;0;0;0;
  190 FOR I%=0 TO 8
  200 LH%=I%*80:RH%=1280-LH%
  210 BT%=I%*60:UP%=1024-BT%
  220 VDU 24,LH%;BT%;RH%;UP%;
  230 VDU 24,LH%;BT%;RH%;UP%;
  240 GCOL 0,(128+I%):CLG
  250 NEXT
  260 VDU 26
  270 ENDPROC
  280 :
  290 DEF PROCsave
  300 LOCAL I%,X%
  310 *D+
  320 *OPT 1,0
  330 X%=OPENOUT("SCREEN")
  340 FOR I%=HIMEM TO &8000
  350 BPUT#X%,?I%
  360 NEXT
  370 *D-
  380 CLOSE#X%
  390 *OPT
  400 ENDPROC
  410 :
  420 DEF PROCload
  430 LOCAL I%,X%
  440 *D+
  450 *OPT 1,1
  460 X%=OPENUP("SCREEN")
  470 *OPT 1,0
  480 FOR I%=HIMEM TO &8000
  490 ?I%=BGET#X%
  500 NEXT
  510 *D-
  520 CLOSE#X%
  530 *OPT
  540 ENDPROC
```

See Features, page 94

How to enter *Fonts*

Listing 1 is the font generator, and as it is written entirely in Basic, it should be easy to enter.

Listing 2 is the source program for the machine code font loading routine. It contains quite a lot of assembly language so a checksum routine has been included at line 1470. This routine will report any errors that you might have made in entering the program. When no errors are reported you will be given the option of saving the finished machine code, which will be saved under the name "FONT". *Refer to the article on page 94 for details on using the routine. Note that lines 270 to 330 should only be entered if you have a 0.9 DFS or earlier – type *HELP to find out which version you have: if you do have a later version, 1.2 for example, then ignore these lines.*

Listing 3 is a demonstration program showing how a variety of

fonts can be used when annotating diagrams (an illustration of this can be seen on page 95). You will, though, need to create italic, bold and modern fonts using the font generator (and save these with the names "ITALIC", "BOLD" *and* "MODERN" *respectively) before the demonstration program can be run. Again, refer to the article on page 94 for details.*

Listing 1. Matthew Cook's font generator program

```
   10 REM Font Generator
   20 REM by Matthew Cook
   30 REM BBC B/B+/128k and Electron
   40 REM (c) Acorn User December 1985
   50 :
   60 @%=&903
   70 DIM B(8,8),oscli% 40
   80 ON ERROR GOTO 1100
   90 *FX 4,1
  100 IF PAGE<>&2100 THEN PRINT"Reload a
t &2100":END
  110 MODE 4
  120 P=65
  130 REPEAT
  140 PRINT TAB(5,21);
  150 FOR loop=P-12 TO P+12
  160 P$=CHR$(loop)
  170 IF loop<32 OR loop>255 OR loop=127
 THEN P$=" "
  180 IF loop<32 OR loop>255 THEN PRINT"
.";:NEXT loop:GOTO 270
  190 IF loop=P THEN VDU32,10:PRINTP;:VD
U11,8,8,11:PRINTP$"  ";:VDU10:ELSE PRINT
P$;
  200 NEXT
  210 PRINT TAB(0,0);"LEFT ARROW    -LEFT
"'"RIGHT ARROW  -RIGHT"
  220 PRINT"SPACE          -EDIT LETTER"'"
'B'          -BOLD"
  230 PRINT"'F'            -ITALIC"'"'I'
     -INVERSE CHARACTER"
  240 PRINT"'M'            -MODERN FONT"
  250 PRINT"'S'            SAVE"'"'L'
     LOAD"
  260 PRINT'"'Z'           ZAP 26 CHARACT
ERS"
  270 A$=GET$
  280 *FX 15,1
  290 IF A$=CHR$(136) THEN P=P-1
  300 IF A$=CHR$(137) THEN P=P+1
  310 IF A$=" "THEN PROCalter:CLS
  320 IF A$="F" THEN PROCbits:PROCitalic
:PROCreplace
  330 IF A$="B" THEN PROCbits:PROCbold:P
ROCreplace
  340 IF A$="I" THEN PROCbits:PROCinvers
e:PROCreplace
  350 IF A$="S" THEN PROCsave
  360 IF A$="L" THEN PROCload
  370 IF A$="M" THEN PROCbits:PROCmodern
:PROCreplace
  380 IF A$="Z" THEN PROCzap
  390 VDU 28,0,25,39,13
  400 CLS
```

Continued ►

◄ Continued

```
  410 VDU 26:UNTIL FALSE
  420 DEF PROCbits
  430 FOR T=1 TO 32 STEP 4
  440 FOR X=1 TO 32 STEP 4
  450 IF POINT(FNx(X),FNy(T))=FNc THEN B
(X/4,(32-T)/4)=-1:ELSE B(X/4,(32-T)/4)=0
  460 NEXT:NEXT
  470 ENDPROC
  480 DEF FNc=1
  490 DEF FNy(Y)=Y+354
  500 DEF FNx(X)=X+610
  510 DEF PROCprin
  520 PRINT TAB(0,0);
  530 LOCAL X,Y
  540 FOR Y=0 TO 7:PRINT'SPC(15);
  550 FOR X=0 TO 7
  560 IF B(X,Y) THEN PRINT"O"; ELSE PRIN
T".";
  570 NEXT:NEXT
  580 ENDPROC
  590 DEF PROCalter
  600 PROCbits:CLS:PROCprin
  610 PRINT TAB(0,20)"ARROW KEYS    MOVE
AROUND"'"'I'            INVERSE PIXEL"
  620 PRINT"'D'   'T'         SHIFT ROW LEFT/
RIGHT"'"SPACE          BACK TO MAIN MENU"
  630 PRINT "'R'             REDIFINE THIS
CHARACTER"'"'W'          WIPE WHOLE CHAR
ACTER"
  640 XP=1:YP=1
  650 REPEAT
  660 *FX 4,1
  670 A$=INKEY$(10)
  680 IF ADVAL(2)>60000 A$=CHR$(139)
  690 IF ADVAL(2)<5000 A$=CHR$(138)
  700 IF ADVAL(1)<5000 A$=CHR$(137)
  710 IF ADVAL(1)>60000 A$=CHR$(136)
  720 IF (ADVAL(0) AND 3)<>0 A$="I"
  730 IF A$=CHR$(137) AND XP<7 XP=XP+1
  740 IF A$=CHR$(136) AND XP>0 XP=XP-1
  750 IF A$=CHR$(138) AND YP<7 YP=YP+1
  760 IF A$=CHR$(139) AND YP>0 YP=YP-1
  770 IF A$=" " THEN UNTILTRUE:ENDPROC
  780 IF A$="R" THEN PROCreplace:PRINTTA
B(0,0);CHR$(P);
  790 IF A$="W" THEN PROCwipe:PROCprin
  800 IF A$="I" THEN B(XP,YP)=NOT B(XP,Y
P):PROCprin
  810 PRINTTAB(15+XP,YP+1);"#";TAB(15+XP
,YP+1);
  820 PRINT;CHR$(((B(XP,YP)=-1)*-(ASC("O
")))+(B(XP,YP)=0)*-(ASC(".")))
  830 IF A$="D" THEN PROCsl:PROCprin
  840 IF A$="T" THEN PROCsr:PROCprin
  850 IF A$="F" THEN PROCitalic:PROCprin
:PROCreplace
  860 UNTILFALSE
  870 DEF PROCreplace
  880 VDU 23,P
  890 FOR T=0 TO 7
  900 VDU FNbin(T)
  910 NEXT
  920 ENDPROC
  930 DEF FNbin(N)
  940 =(FNseg(0,N)*16)+FNseg(4,N)
  950 DEF FNseg(P,N)
```

Continued ►

◄ Continued

```
 960 LOCAL T,TTL
 970 TTL=0
 980 FOR T=P TO P+3
 990 TTL=TTL+(B(T,N)* -(2^ (3-(T-P))))
1000 NEXT
1010 =TTL
1020 DEF PROCsave
1030 CLS
1040 REPEAT
1050 INPUT"Filename for <save> ?"F$
1060 UNTIL LENF$<8 AND F$<>""
1070 PROCoscli("SA. "+F$+" 1B00 2100")
1080 CLS
1090 ENDPROC
1100 IF ERR=17 THEN PROCoscli("FX4"):EN
D:ELSE CLS:REPORT:PRINT" at line ";ERL:P
RINT"Press any key ...":A$=GET$:CLS:GOTO
 130
1110 END
1120 DEF FNhex(D%)
1130 LOCAL T1,T,T2,H$
1140 T1=D% AND 15
1150 T2=D% AND 240
1160 T2=D%/16
1170 =FNseg2(T2)+FNseg2(T1)
1180 DEF FNseg2(X)=MID$("0123456789ABCD
EF",X+1,1)
1190 DEF FNhex2(BIG%)=FNhex((BIG% AND &
FF00)/256)+FNhex((BIG% AND &00FF))
1200 DEF PROCload
1210 INPUT"File name ?"F$
1220 PROCoscli("FONT "+F$)
1230 CLS
1240 ENDPROC
1250 DEF PROCsl
1260 LOCAL T$
1270 T$=FNg(YP)
1280 T$=T$+"0":T$=RIGHT$(T$,8)
1290 PROCg(T$,YP)
1300 ENDPROC
1310 DEF PROCsr
1320 LOCAL T$
1330 T$=FNg(YP)
1340 T$="0"+T$:T$=LEFT$(T$,8)
1350 PROCg(T$,YP)
1360 ENDPROC
1370 DEF FNg(Y)
1380 LOCAL D$
1390 FOR T=0 TO 7
1400 D$=D$+STR$(- B(T,Y))
1410 NEXT
1420 =D$
1430 DEF PROCg(D$,Y)
1440 LOCAL T
1450 FOR T=0 TO 7
1460 B(T,Y)=-VAL(MID$(D$,T+1,1))
1470 NEXT
1480 ENDPROC
1490 DEF PROCitalic
1500 LOCAL YP,A
1510 DATA 0,-1,-1,0,0,1,1,2
1520 RESTORE 1510
1530 FOR NN=7 TO 0 STEP -1
1540 YP=NN
1550 READ A
1560 IF A=-1 THEN PROCsl:NEXT:ENDPROC
```

Continued ►

◄ Continued

```
1570 IF A=1 THEN PROCsr:NEXT:ENDPROC
1580 IF A=2 THEN PROCsr:PROCsr:NEXT:END
PROC
1590 NEXT
1600 ENDPROC
1610 DEF PROCbold
1620 FOR T=0 TO 7
1630 FOR X=7 TO 1 STEP -1
1640 B(X,T)=(B(X-1,T)) OR B(X,T)
1650 NEXT:NEXT
1660 ENDPROC
1670 DEF PROCinverse
1680 FOR T=0 TO 7:FORX=0 TO 7:B(T,X)=NO
T B(T,X):NEXT:NEXT
1690 ENDPROC
1700 DEF PROCwipe
1710 FOR T=0 TO 7
1720 FOR X=0 TO 7:B(T,X)=0
1730 NEXT:NEXT:ENDPROC
1740 DEF PROCmodern
1750 FOR T=0 TO 7
1760 FOR X=0 TO 7
1770 IF B(X,T) THEN B(X,T)=FALSE:X=8:NE
XT:ELSE NEXT
1780 FOR X=7 TO 0 STEP -1
1790 IF B(X,T) THEN B(X+1,T)=-1:X=-1:NE
XT:ELSE NEXT
1800 NEXT
1810 ENDPROC
1820 DEF PROCzap
1830 CLS
1840 PRINTTAB(0,0);"1.....BOLD"'"2.....
ITALIC"'"3.....INVERSE"'"4.....MODERN"'
1850 PRINT'"Which one shall I do 26 tim
es - from thepresent character ?"
1860 PRINT"PRESS '0' TO NOT DO ANYTHING
"
1870 REPEAT A=GET:UNTIL A>47 AND A<53
1880 IF A=48 THEN CLS:ENDPROC
1890 A=A-48
1900 L=P:FORP=L TO L+25
1910 PRINT TAB(19,20);CHR$(P)
1920 PROCbits
1930 IF A=1 THEN PROCbold
1940 IF A=2 THEN PROCitalic
1950 IF A=3 THEN PROCinverse
1960 IF A=4 THEN PROCmodern
1970 PROCreplace
1980 PRINT TAB(19,21);CHR$(P)
1990 NEXT
2000 CLS
2010 ENDPROC
2020 DEF PROCoscli($oscli%)
2030 X%=oscli%:Y%=oscli% DIV 256
2040 CALL &FFF7:ENDPROC
```

Listing 2. Font source program

```
10 REM *FONT source program
20 REM by Matthew Cook
30 REM BBC B/B+/128k and Electron
40 REM (c) Acorn User December 1985
50 :
```

Continued ►

◀ Continued

```
60 L=&900
70 oswrch=&FFEE:osbyte=&FFF4
80 osword=&FFF1
90 osbget=&FFD7:osfind=&FFCE
100 FOR T=0 TO 3 STEP 3
110 P%=&900
120 [
130 OPT T
140 LDA #20
150 LDX #6
160 JSR &FFF4
170 LDA #1
180 LDX #&70
190 LDY #0
200 JSR &FFDA
210 LDX &70
220 LDY &71
230 \ Type lines 270 - 330
240 \ only if you have a
250 \ 0.9 DFS or earlier
260 :
270 TXA
280 CLC
290 ADC #5
300 TAX
310 TYA
320 ADC #0
330 TAY
340 :
350 LDA #&40
360 JSR osfind
370 TAY
380 BNE skip
390 JMP end
400  .skip
410 LDX #&FF
420 LDA #&A0
430 JSR gt
440 LDX #&FF
450 LDA #&C0
460 JSR gt
470 LDX #&FF
480 LDA #&E0
490 JSR gt
500 LDX #&FF
510 LDA #&20
520 JSR gt
530 LDX #&00
540 LDA #&40
550 JSR gt
560 LDX #&00
570 LDA #&60
580 JSR gt
590 .fin
600 LDA #0
610 LDY #0
620 JSR osfind
630 RTS
640 .gt
650 CLC
660 STA alt1
670 ADC #&20
680 STA alt2
690 .loop
700 CPX #&FF
710 BNE over
```

Continued ▶

◀ Continued

```
720 JSR gt8
730 JMP back
740 .over
750 LDA #23
760 JSR oswrch
770 LDA alt1
780 JSR oswrch
790 LDA #7
800 STA temp
810 .tialoop
820 JSR osbget
830 BCS enfile
840 JSR oswrch
850 DEC temp
860 BPL tialoop
870 .back
880 INC alt1
890 LDA alt2
900 CMP alt1
910 BEQ gten
920 JMP loop
930 .gten
940 RTS
950 .gt8
960 LDA #7
970 STA temp
980 .gt8loop
990 JSR osbget
1000 BCS enfile
1010 DEC temp
1020 BPL gt8loop
1030 RTS
1040 .file
1050 OPT FNequs("ITI"+CHR$(13),T)
1060 .temp
1070 OPT FNequb(0,T)
1080 .enfile
1090 LDA #0
1100 LDX #8
1110 .12
1120 JSR oswrch
1130 DEX
1140 BNE 12
1150 BRK
1160 OPT FNequb(13,T)
1170 OPT FNequs("Endfile"+CHR$(0),T)
1180 .end
1190 BRK
1200 OPT FNequb(14,T)
1210 OPT FNequs("Can't open file",T)
1220 BRK
1230 .alt1
1240 OPT FNequb(0,T)
1250 .alt2
1260 OPT FNequb(0,T)
1270 NOP:NOP
1280 NOP:NOP
1290 NOP:NOP
1300 NOP:NOP
1310 ]:NEXT
1320 :
1330 PROCcheck
1340 PRINT"Save code? (Y/N) ";
1350 q$=GET$
1360 PRINTq$
```

Continued ▶

◀ Continued

```
 1370 IF q$="Y" OR q$="y" THEN *SAVE FON
T 900 9FF
 1380 END
 1390 DEF FNequb(byte,opt)
 1400 ?P%=byte
 1410 P%=P%+1
 1420 =opt
 1430 DEF FNequs(string$,opt)
 1440 $P%=string$
 1450 P%=P%+LEN(string$)
 1460 =opt
 1470 DEF PROCcheck
 1480 total%=0
 1490 FOR byte%=&900 TO P%-1
 1500 total%=total%+?byte%
 1510 NEXT byte%
 1520 IF total%=25747 OR total%=24700 EN
DPROC
 1530 PRINT"Error - Check listing":END
```

Listing 3. Font demonstration program

```
   10 REM *FONT Demonstration Program
   20 REM by Matthew D Cook
   30 REM BBC B/B+/128k and Electron
   40 REM (c) Acorn User December 1985
   50 :
   60 IF PAGE<>&2100 PRINT"Reload at &21
00":END
   70 big=512
   80 offset=512
   90 ON ERROR VDU 4:END
  100 *FX 20,6
  110 VDU 23,224,0,7,28,116,20,18,16,0
  120 MODE 1
  130 PROCsetup
  140 PROCgraphs
  150 PROCwrite
  160 VDU 4
  170 a$=GET$
  180 END
  190 :
  200 DEF PROCsetup
  210 GCOL 0,1
  220 MOVE 0,0
  230 DRAW 0,1024
  240 MOVE 0,512
  250 DRAW 1278,512
  260 GCOL 0,3
  270 ENDPROC
  280 :
  290 DEF PROCgraphs
  300 GCOL 0,2
  310 PROCgraph("SIN(X/200)")
  320 GCOL 0,3
  330 PROCgraph("COS(X/200)")
  340 GCOL 0,1
  350 PROCgraph("TAN(X/200)")
  360 ENDPROC
  370 :
  380 DEF PROCgraph(arg$)
  390 X=0
  400 MOVE 0,(EVAL(arg$)*512)+512
  410 FOR X=0 TO 1257 STEP 8
```

Continued ▶

◀ Continued

```
  420 Y=(EVAL(arg$)*big)+offset
  430 IF Y>1024 OR Y<0 THEN MOVEX,Y:ELSE
DRAW X,Y
  440 NEXT X
  450 ENDPROC
  460 :
  470 DEF PROCwrite
  480 VDU 5
  490 MOVE 8,32
  500 PRINT "-1"
  510 MOVE 8,992
  520 PRINT "+1"
  530 MOVE 24,544
  540 PRINT "0"
  550 MOVE 410,1000
  560 *FONT BOLD
  570 GCOL 0,2
  580 PRINT "SIN(X)"
  590 MOVE 928,950
  600 GCOL 0,3
  610 PRINT "COS(X)"
  620 MOVE 750,800
  630 GCOL 0,1
  640 PRINT "TAN(X)"
  650 MOVE 350,550
  660 PRINT "X Axis"
  670 MOVE 8,400
  680 PROCvertical("Y Axis")
  690 MOVE 300,200
  700 *FONT ITALICS
  710 PRINT "Trigonometric functions"
  720 GCOL 0,2
  730 MOVE 62,150
  740 *FONT MODERN
  750 PRINT "SIN, COS AND TAN (X); FOR X
=0 TO X=2"CHR$(224);
  760 GCOL 0,3
  770 ENDPROC
  780 :
  790 DEF PROCvertical(vert$)
  800 FOR t=1 TO LEN(vert$)
  810 PRINT MID$(vert$,t,1);:VDU8,10
  820 NEXT
  830 ENDPROC
```

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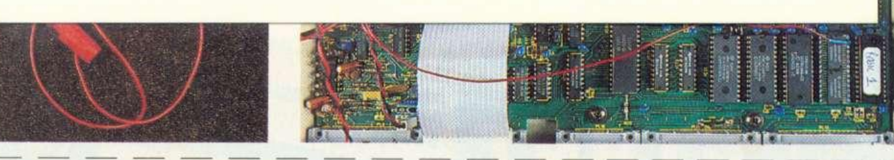
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◀ Continued

```
  1370 IF q$="Y" (
T 900 9FF
  1380 END
  1390 DEF FNequb
  1400 ?P%=byte
  1410 P%=P%+1
  1420 =opt
  1430 DEF FNequs
  1440 $P%=string$
  1450 P%=P%+LEN(s
  1460 =opt
  1470 DEF PROCche
  1480 total%=0
  1490 FOR byte%=$
  1500 total%=tota
  1510 NEXT byte%
  1520 IF total%=:
DPROC
  1530 PRINT"Error
```

Listing 3. Font demonstration pr

```
   10 REM *FONT D
   20 REM by Matt
   30 REM BBC B/B
   40 REM (c) Acc
   50 :
   60 IF PAGE<>&2
00":END
   70 big=512
   80 offset=512
   90 ON ERROR VD
  100 *FX 20,6
  110 VDU 23,224,
  120 MODE 1
  130 PROCsetup
  140 PROCgraphs
  150 PROCwrite
  160 VDU 4
  170 a$=GET$
  180 END
  190 :
  200 DEF PROCset
  210 GCOL 0,1
  220 MOVE 0,0
  230 DRAW 0,1024
  240 MOVE 0,512
  250 DRAW 1278,512
  260 GCOL 0,3
  270 ENDPROC
  280 :
  290 DEF PROCgraphs
  300 GCOL 0,2
  310 PROCgraph("SIN(X/200)")
  320 GCOL 0,3
  330 PROCgraph("COS(X/200)")
  340 GCOL 0,1
  350 PROCgraph("TAN(X/200)")
  360 ENDPROC
  370 :
  380 DEF PROCgraph(arg$)
  390 X=0
  400 MOVE 0,(EVAL(arg$)*512)+512
  410 FOR X=0 TO 1257 STEP 8
```

Continued ▶







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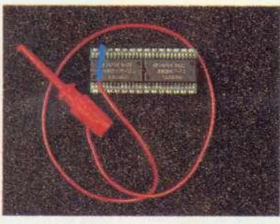
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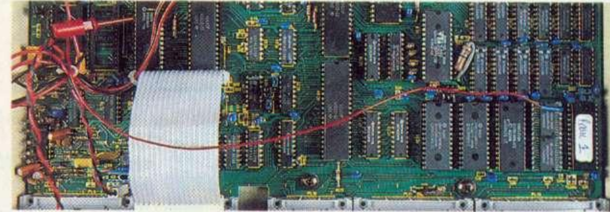
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BEEB FORUM

Edited by Bruce Smith, the offerings this month include a one line screen dump, a tip for *Wordwise Plus* users and a challenge!

£10
CENTRED TEXT ON SCREEN

Although named Beeb Forum, this portion of *AU* is certainly not limited to the BBC micro alone. I am always pleased to receive letters and routines from Electron owners, and to prove the point the following Electron-only procedure has been sent in by B Gabel of Lewes.

The procedure (listing 1) will take some text passed into it via a string and print it centrally on the specified screen line, thus avoiding the need to calculate the Tab values for the screen mode in use. This is particularly useful if you are changing mode several times within a program, or if the text to be printed centrally will be of a varying length.

Strings of text longer than the width of the screen are not allowed. Mr Gabel explains:

The procedure begins by ascertaining the screen mode.

It does this by looking at the Operating System copy of the ULA register SHELIA &FE07, which is held in location 282 hex. Bits

```
1000 DEFPROCcentre(y%,m$)
1010 LOCALm%,w%,l%,x%
1020 m%=((?&282) AND 56)/8
1030 IF m%=0 OR m%=3 w%=80
1040 IF m%=1 OR m%=4 OR
m%=6 w%=40
1050 IF m%=2 OR m%=5 w%=20
1060 l%=LEN(m$)
1070 IF l%>w% VDU7:ENDPROC
1080 x%=(w%-l%)/2
1090 PRINTTAB(x%,y%);m$
1100 ENDPROC
```

Listing 1. Prints text centrally on screen

3, 4 and 5 hold the mode number and so the rest are masked out using AND 56. The result is then shifted 3 bits to the right by dividing it by eight. This leaves the mode number which is put into m%. The rest of the procedure then just computes the width of the screen and centres the text string accordingly. Obviously if the string is an odd number of characters long, then it is impossible to centre it exactly; it will be one character too far to the left. This, however, should present no problems. Therefore typing:

PROCcentre (20, "Acorn User")

will print "Acorn User" in the centre of the 20th line down (ie, like the Y co-ordinate of a Tab statement) in any mode! Or you can:

INPUT name$
PROCcentre (16, name$)

This will print the name entered in the middle of the 15th line down in any mode. This is very useful to produce a 'professional look'.

Mr Gabel could, of course, use OSBYTE &87 to ascertain the screen mode. When called, the mode number is returned in the X register. By changing line 1020 of the procedure Beeb owners can also take advantage of the routine.

£5
WORDWISE PLUS SEGMENTS

R Green of Rotherham is a teacher who has helped his pupils use their Beebs and Electrons to prepare all their reports, using just a single BBC micro at school fitted with *Wordwise Plus* and a short segment program (listing 2). Mr Green explains . . .

The text of the report is prepared at home using Basic's line numbers. Typing AUTO first makes this process a fairly painless task. Once complete the program is saved to tape or disc as an ASCII file using *SPOOL. At school the segment program is loaded into Segment 0 and this program is executed by pressing Shift-

```
CLS
print"Filename to
  be stripped >";
A$=glk$
select text
load text A$
cursor bottom
cursor up
delete word
cursor top
delete word
delete at 6
repeat
find "|"
delete at 7
type CHR$13
until eot
display
```

Listing 2. A short segment program

f0. The filename is entered, the file is loaded in and the program deletes all excess text, ie, line numbers and commands, from the file leaving just the text. This can then be formatted to suit your needs.

£5
ONE-LINER AND A CHALLENGE

One line printer dumps have graced these pages over the past year or so. Their only draw-back tends to be the time they take to perform the task in hand.

Simon Hallam of Atherstone was inspired by Bernard Beeston's one-liner in September '84 and decided to grease its sides enough

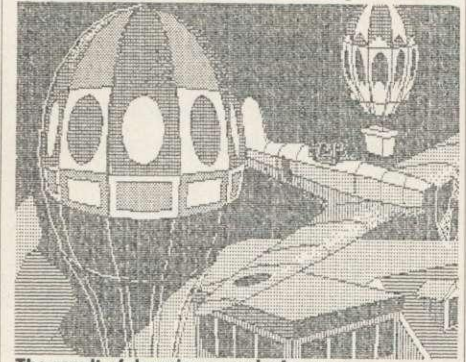
```
10 VDU2,1,27,1,51,1,24:FOR
C%=&57F0 TO &5928 STEP 8:VDU
1,27,1,42,1,0,1,0,1,1:FOR A%
=C%+&26D0 TO C% STEP-320:
FOR B%=A%+7TOA% STEP-1:VDU1,
?B%:NEXT,:VDU1,13,1,10:NEXT:
VDU3
```

Listing 3. Simon Hallam's one-line screen dump

for it to break the one minute barrier.

Simon's program, or rather line, will dump the contents of a mode 4 screen to an Epson FX80 or compatible printer (ie, Star, Shinwa, etc) in just 55 seconds.

As shown, the routine will produce an



The result of dumping a mode 4 screen

inverse (or normal) screen dump. This can be changed to a true 'colour' dump by changing VDU 1,?B% to VDU 1, NOT ?B.

The routine is 'illegal' in that it peeks screen memory – which accounts for the increased speed. Users of second processors and shadow RAM boards such as the Aries should switch them off beforehand.

Now, here come the challenge. There are three prizes (£20, £10 and £5) waiting for the best use of a single line program. The program can be anything you want it to be – a three second screen dump, a full 16 channel sound editor, a multi-mode sprite generator or *Elite 6*. Just make sure that it has a good practical use!

ATOM FORUM

Mike Barwise turns his mind to aspects of Atomic energy, and answers some readers' queries

LIGHT PEN ENLIGHTENMENT

Is there any way of connecting a light pen to the Atom, asks John Goldsmith on behalf of the Heron Computing Club, Bury St Edmunds? There is, but making it work will depend on what you want to do with it.

The concept of the light pen is based on the way the video picture is maintained. Video information in most home computers is stored in what is called a bit map. This means that an area of memory is set aside to hold either the actual pixel pattern of the screen (as in Atom mode 4) or references to the storage of that information elsewhere (text mode). (The actual pixel patterns for text characters are stored in a ROM built into the video controller, and the character codes in RAM amount to the addresses applied to that ROM.)

Either way, ultimately a continuous stream of bits is sent via a parallel to serial converter, down the video cable to the monitor. For the purposes of argument, say a one (high) bit causes the scanning spot in the monitor tube to light up, and a zero (low) causes it to remain unlit. The frame is re-written on the monitor every 60th of a second.

Any fixed point on the screen is thus being turned on (lit) or off (allowed to fade) 60 times a second. In graphics mode 4, this point or pixel corresponds to an absolute address in the video RAM which holds the bit map.

A light pen is simply an optical sensor which detects the intensity pulse of the pixel you are pointing it at and sends a signal to the computer via a suitable port. The magic is to use that signal to do something useful.

This is not as difficult as it sounds. You can cheat and use a CRT controller with a light pen register, but that's just using someone else's cleverness. The 6847 does not have an internal light pen register, but it's not a complicated add-on in concept.

Every video frame starts after an FS (frame sync) pulse. This sets the video beam to the top left corner and starts it scanning. Data bits are then sent at a fixed rate as the beam scans, forming the first line of the image, and this process is repeated for each line of the screen. There is also an HS (horizontal sync) pulse available, as the CRT needs to be told when to expect the start of every line.

Thus, given a pixel counter per line and a line counter, both of which are synchronised to the video bit stream using FS and HS, the absolute address of any pixel on the screen may be calculated from the contents of the counters at any time. The action of the light pen is just to provide an output pulse which freezes the counters until you have read their contents. You will then know where you were when the count froze, and software can take over to do what you want with the chosen pixel.

In practical terms, the construction of a light pen and interface which will discriminate individual pixels is a job which requires some ingenuity, and it may not be cheap. However, for text manipulation the light pen needs to be much less precise and costly, and the counting job requires a lot less hardware and conceptual understanding of the video frame.

The character RAM for Atom text mode holds bytes which are used as the base addresses of the locations in the 6847 internal ROM where the bit stream (pixel map) patterns are stored. Whenever you are not writing to video RAM (which means most of the time, even when you are typing to the screen) the 6847 is continuously generating addresses to the video RAM and picking up the character references for use by its screen refresh ROM. Thus the address on the 6847 AD lines at any moment points to a specific RAM location and hence a specific character slot on the screen. A nine bit latch fed from the lower nine address lines can be frozen by the light pen output pulse to identify one of the 512 character slots on the text mode screen.

A technical problem of interfacing is to include hardware to lock out the light pen latch freeze during CPU accesses to the RAM to avoid contention.

The MR (memory request) pin of the 6847 is already nearly adquately controlled for this purpose. The nine bit latch is probably best divided into a four bit row nibble and a five bit column nibble, so that direct reads can be compared with the equivalent Zero Page row and column stores.

It's possible to obtain opto sensors with built in microchips providing a wide range of characteristics. The ideal, though expensive, is a receptor with a digital output triggered by a sudden change at the opto input rather than at a finite light level. This will substantially reduce interference from room light, etc. A more conventional linear sensor can frequently be adapted via external electronics to this response with some saving in cost.

Purely practical problems are encountered in the design of the pen itself, in terms of ensuring adequate sensitivity without spurious triggering as a result of screen flicker, etc. The simple answer is to include an enable push button on the pen, for use when correctly positioned on the screen. Attention to the pen tip to avoid damage to the VDU screen surface is also important.

Any bright ideas or circuit designs based on these notes will be welcome candidates for discussion on these pages, so let's get experimenting. There may even be another approach I haven't thought of!

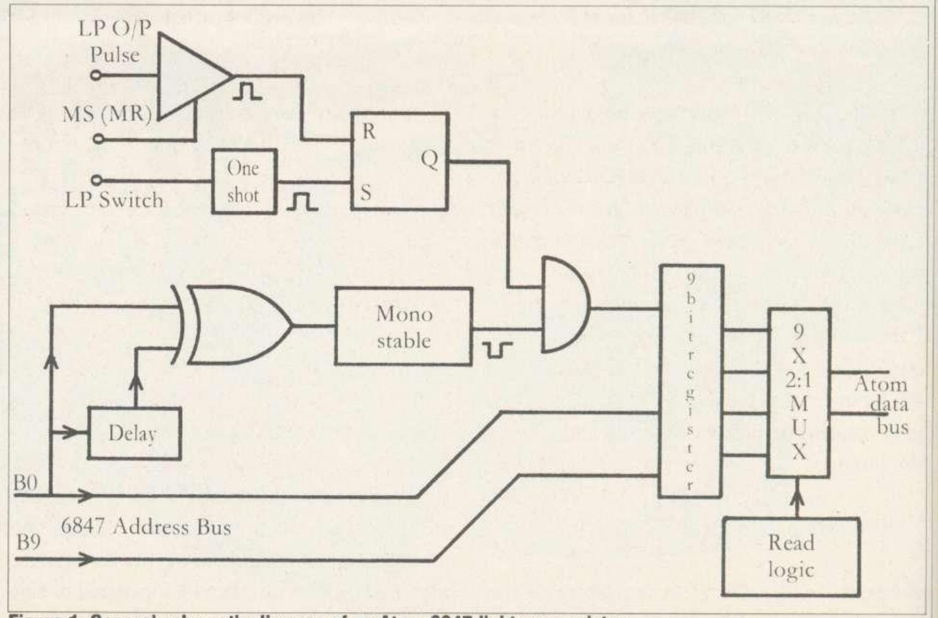


Figure 1. General schematic diagram of an Atom 6847 light pen register

ATOM FORUM

VIDEO CHIP QUERIES

And another question from the Heron Computing Club – on the Atom circuit board, what is link 4 for, and what are the video output lines phA, phB, CHB and notHS?

Link 4 was never very fully documented, but it appears to be a select link for one or other of the two four-colour palettes of the 6847 video controller.

The mysterious outputs, available incidentally on the 10-way connector you attach your monitor cable to, are RGB and sync outputs for a colour monitor to the American NTSC (Never Twice the Same Colour) standard. The conversion of NTSC to PAL (the UK standard) is quite involved, so you can't just plug in an RGB monitor bought in the UK and expect it to work. There are conversion boards around, though, and I am keeping my eyes open and will keep you informed.

TWICE THE SPEED: TWICE THE TROUBLE?

I have received another suggestion about how to run the Atom at 2MHz, this time from Anders Erlandsson of Finspang, Sweden. The real question, however, is, not how to, but whether to.

The actual conversion job is trivial enough, as the divider circuit has a 2MHz output unused. Fitted with a 6502A, the 12k Atom will frequently just about run at 2MHz, if you discount the cassette interface which will try to run at 600 baud. The cassette tones will also be doubled in frequency.

The VIA which constitutes the printer port could be changed to a 2MHz version, but the printer strobe is software controlled, so it might well not prove long enough at 2MHz for reliable printer operation – this will depend on your printer. The 8255 could be changed as well, to allow reliable operation of the keyboard at the increased speed, but often at a considerable price disadvantage.

On the positive side, Atom Basic is really fast at 2MHz. It is a moot point whether it is actually faster or only just about matches the speed of the BBC micro at this clock rate. This is, however, the only advantage. File transfer via I/O ports will in no way benefit, as data rates to the outside world are relatively slow anyway and dictated by the real world device rather than the memory buffer speed.

Screen noise may be exacerbated, as twice the number of CPU accesses will be made in relation to the refresh DMA rate. Contention could even occur, causing screen flicker.

The bus expansion will not function reliably at 2MHz, due to the delays induced by adequate buffering of the address lines, so you now have a fast machine with no cassette interface and no possibility of running discs.

Several readers will no doubt answer with 'but I've done the 2MHz conversion and it works fine!' This may be so, but not for everyone and not necessarily for protracted periods of operation.

What we are discussing in reality is reliability as a function of system timing margins (what a mouthful!). This is essentially a statistical concept, and is based on averages determined by observation, due to the enormous range of potential contributing factors.

It is easy to forget when using Atom Basic that the micro is not working at the speed of a typewriter, but whipping along at an average 300,000 instructions per second (running at 1MHz). Subjective reliability is reckoned in crashes per working day or week. One crash a week is bad, more than once a day and the micro should hit the junk pile. Assuming about four hours work on the micro per day, you should scrap it if it loses itself more often than a ratio of once in 4.3 thousand million.

To achieve this order of reliability (which is still awful – one crash per four hours on average) there must be a very high tolerance in all critical areas of operation. The major factors involved are, in reducing order of influence:

1. The 'access time' of the slowest device in the system. Access time is a summation of the delays induced by the logical pathways and any micro-cycle operations inside a given silicon package, and can be taken to indicate the real average or maximum wait between an initiation and a result. In terms of RAM, for example, the access time is the delay between the application of a stable address to the chip and the availability of a stable data word. It is usually quoted in manufacturers' data, but can be significantly degraded by adverse conditions of operation, for example, low power supply voltage.

2. Any differential delays in the address or data busses caused by either decoding chips or parallel devices.

3. The thermal and loading characteristics of microchips, and their influence on timings.

These factors are too involved to discuss in depth here, but if the slowest device in the system has an access time of not more than half the clock cycle time, the other factors can be ignored (generally) and the system should function with reasonable reliability. This means 450nS at 1MHz and 220nS at 2MHz are the slowest devices it is safe to run if you want a reasonable error rate (say, one in 100 thousand million or one crash per 40-hour week).

There is the major problem, as the main OS ROM is a mask programmed 450nS part, and is not pin compatible with the equivalent EPROM, so even an EPROM version from a licensed source would not be a plug-in replacement.

The ideal, given a legal and compatible 200nS OS, would be to have a two-speed clock (as on the BBC micro) which runs at 2MHz during memory and number crunching, and at 1MHz during in/out operations. However, as Acorn found out, technical considerations make the two-speed clock on the 6502 a significant design problem. I think the modification would require too much hacking about of the board to be a good idea.

It's worth noting that even at 2MHz you will probably not get twice as much work done, as most micro tasks incorporate a substantial proportion of I/O which cannot readily be speeded up.

CORRUPTION-FREE SCREEN SAVING

How to save and reload mode 4 screens without corruption due to prompts has been bothering some readers.

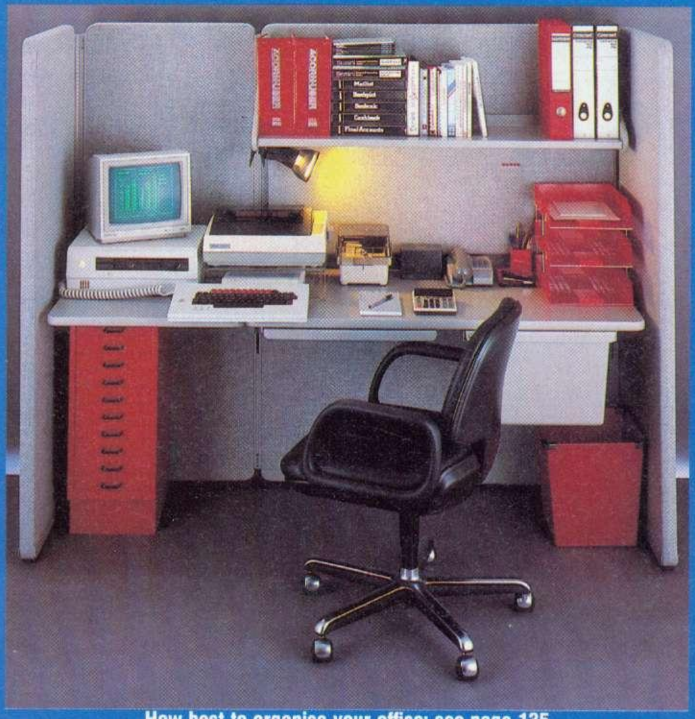
When you save a screen, send a NAK ($21) first. This stops anything passing down WRCVEC being written to the screen. If you are using tape, it's probably a good idea to include a BELL ($7) or two prompt you to hit Space when required. You will have to ACK ($6) after the save to get your subsequent input echoed to the screen again.

On reloading, the only corruption is normally the return to Basic prompt when a program finishes. If the screen load is the last thing you do, a prompt will corrupt the screen when the program ends. So the best thing to do is follow the screen load with either a delay loop giving you time to use your screen, or an infinite loop (line X GOTO line X) which requires Escape to exit.

This column is your contact point with other Atom users, but don't forget to read the rest of the magazine as well – lots of ideas can be transported from the BBC micro. If you have a question ask it – maybe another reader knows the answer.

If you've invented a routine or discovered a hardware modification for the Atom here's a chance to show your originality and win some cash. Send your idea to: Mike Barwise, Atom Forum, Acorn User, Redwood Publishing, 68 Long Acre, London WC2E 9JH.

ACORN USER



How best to organise your office: see page 135

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131,133

Setting up for business
135

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141

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Edward Brown and Richard Clement continue their support for users of the CP/M business operating system on BBC Z80 second processors.

Plus there will be regular reviews of business hardware and software.

And all this coverage demands the best authors: Bruce Smith, author of 16 books including a guide to CP/M; Edward Brown and Richard Clement, prominent members of theBritish CP/M user group; George Hill, author of the UserDUMP printer control ROM and a regular *Acorn User* writer for three years; and Simon Williams, whose book on using the BBC micro in business has just been published by BBC Publications.

But the best contributors are you, the readers: state your opinions, tell us the news and let us know your needs. That way we can really get down to business.

A plum from Peartree

The 128k BBC B+ is at the heart of a complete business package of hardware and software for an inclusive price of £1345.50. The KBL 128 PC from Peartree Systems comes in an IBM-style package with an integrated suite of software.

The KBL 128 PC doesn't look at all like a BBC micro. The main printed circuit board has been housed inside a totally new case, which also incorporates a pair of double-sided 80-track disc drives and cooling fan.

The latest Acorn Disc Filing System (ADFS) is fitted as standard, so discs can be used for double density storage – in effect, a total of 1.4Mb. The Acornsoft *View* wordprocessor is also fitted.

The keyboard (which is completely detached) is based on the popular IBM PC design and works on an infra red device in a similar way to a remote TV or video control. As the keyboard can be up to seven metres from the rest of the system it should cope with the largest of offices.

Included in the price is a hi-resolution green screen monochrome monitor, providing comfortable viewing in 80 column mode. A colour monitor costs an extra £241.50 including VAT.



KBL: 'The software alone is well worth the price of the system'

The export market has not been overlooked, with French, Greek and Arabic Operating Systems already available, and User Guides appropriately translated. Spanish, Danish, Swedish, German and Italian versions will follow.

Peartree Systems marketing director, Vartan Mundigan, sees the software supplies with the KBL 128 PC as an important feature. He said, 'The software alone is well worth the price of the system – in fact we're giving the computer away with the software!"

The philosophy behind the system is to provide the businessman with a complete set-up. Mr Mundigan continued, 'People want to buy a complete system, they don't want to look around gathering their equipment together from several sources in the hope that it will work. For £1200 they can become completely computerised.'

The software comes under ten headings: wordprocessor (*View*), stock control, customer database, purchase ledger, sales ledger, sales ledger, nominal ledger, invoicing/credit notes, proforma quotations, bank account control and petty cash control.

For further details contact Peartree Systems on (0480) 811573.

Sign on the register

If your business uses a computer for processing details relating to an individual, you are now required to register under the Data Protection Act, which came into effect this month.

Computers handling information for personal, household or recreational purposes are exempt, but business and professional users have until 11 May 1986 to register – at a cost of £22. Failure to register by that date is a criminal offence.

The purpose of Act is to give protection to individuals.

Contact the Data Protection Registrar, Springfield House, Water Lane, Wilmslow, Cheshire SK9 5AX.


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All prices shown above are exclusive of VAT

BUSINESS NEWS

Shops can cash in with Meadow

Meadow Computers has produced BBC micro accounting software for wholesalers and retailers.

Micro-Trader costs £200 (plus VAT) on disc and consists of integrated sales, purchase and nominal ledgers, and can hold up to 450 accounts in each ledger and 4000 transactions per month.

Invoices, credit notes, statements and remittance advice notes can be printed out, along with a profit and loss account and a balance sheet.

Micro-Stock is a stock control program designed to be used with *Micro-Trader* – though it can be used alone. It can handle 4000 stock lines and has invoice and credit note routines for cash and account sales. *Micro-Stock* costs £95 (plus VAT) on disc.

Contact Meadow at: 11 London Street, Whitchurch, Hants RG28 7LH. Tel: (025682) 2008.

Farmlink goes nationwide

Farmlink is now available nationwide. The closed database runs on Prestel and offers micro-owning farmers a variety of agricultural and business information, specialist software and interactive services such as product ordering.

British Telecom, which runs Prestel, was prompted to buy a majority share in Farmlink Services, providers of *Farmlink*, and launch a fully national service.

Telex link-up widens Prestel's scope

Prestel users can now send and receive messages from anyone with a telex machine by using the Telex Link facility.

Messages are created as Prestel response frames which Telex Link then automatically transmits to any business with a telex machine anywhere in the world.

Charges start at 50p per frame for UK destinations and incoming telexes are received free of charge.

The One-to-One electronic mail service can also send and receive telexes.

The service was launched last year and offers telexes and electronic mail between subscribers.

Prices start at £5 per month for a mailbox, a £50 registration fee, plus time-based online charges and, of course, telephone charges.

The company has produced a 'plain man's guide' to electronic mail, available free of charge from One-to-One, Scorpio House, 102 Sydney St, London SW3 6NL.

Torch and Acorn battle over Z80

by Geoff Nairn

The battle for the lucrative Z80 second processors market continues unabated and now Torch and Acorn are squabbling over sales figures.

The Torch ZEP100 – price £330 plus VAT – was first on the market some three years ago and it has recently been enhanced to include a new network version of MCP, which runs applications programs faster.

The Acorn add-on costs £348 plus VAT and comes with the 'real thing' – disc-based CP/M operating system, version 2.2. Both the Acorn and Torch second processors come with bundled software for wordprocessors, database and spreadsheet applications.

Torch's Jan Edbrooke claimed that over 15,000 ZEP had been sold as opposed to 'just a few hundred' for the Acorn Z80.

Acorn's David Bell was reticent about the exact number of Acorn Z80s sold, but claimed it was 'many thousands – certainly not just a few hundred'.

He said: 'Torch stole the lead on us by releasing a Z80 card first, so their greater sales are simply due to the fact that there was initially no competition. Our Z80 is faster than any other Z80 add-on for the BBC micro and is proving very successful.'

For Acorn, the Z80 add-on is the only remaining product from Acorn's foray into business computers. As with Torch, it's a profitable product line for Acorn and when the Z80 market eventually dries up the company will struggle to find a replacement. David Bell would not disclose whether Acorn had any plans for a 16-bit business machine.

BUSINESS TOP FIVE

	Title	Publisher	Cassette	Disc	ROM	Electron	Shadow on B+	6502	Econet
1	Mini Office	Database Publications	£5.95	£7.95 £9.95+	—	£5.95	*	*	— —
2	Wordwise	Computer Concepts	—	—	£56.35	—	—	Yes £4.95	—
3	Viewsheet	Acornsoft	—	—	£59.50	£29.95	Yes	Yes	Yes
4	Wordwise	Computer Concepts	—	—	£56.35	—	—	—	—
5	View	Acornsoft	—	—	£59.80	£29.95	Yes	Yes	Yes

Compiled by Gallup from a panel of specialist dealers. Contact publisher: Database, Europa House, 68 Chester Road, Hazel Grove, Stockport SK7 5NY, 061-480 0171; Computer Concepts, Gaddesden Place, Hemel Hempstead, Herts HP2 6EX, (0442) 63933; Acornsoft, 645 Newmarket Road, Cambridge CB5 8PD, (0223) 214411

+ 3 inch disc

Statistics pack for BBC micro

Instat is a comprehensive statistics package for the BBC micro, developed by the University of Reading and two universities.

Facilities include data summary and presentation, simple and multiple regression, variance analysis, random sampling and plotting.

Data is stored on disc as separate 'worksheets' and subsets are loaded in as needed.

Price to a single user is less than £100, with discounts for educational users.

Details from Statistical Services Centre, Department of Applied Statistics, University of Reading, PO Box 217, Reading RG6 2AN.

Network choice

Networking is a 45-minute video about. . . networking. It aims to cover all aspects of micro networks and enable businesses to decide whether to take the plunge.

The video costs £50 and is presented by former BBC TV newsreader Peter Woods. It's available from Computer Television on 01-631 1801.

Our mistake!

The *Datanurse* nursing administration package was developed by and is available from Syntec Ltd and not from Torch Computers. Price for the software is £995. Further details on (0234) 857105.

BUSINESS

MINDING YOUR OWN BUSINESS MADE EASY

In this article, the first in a series of three, advice and guidance are given to those wanting to set up a business system

Roger Carus

If you run a business, either full- or part-time, you may wonder whether it is possible to use a BBC micro to help you. Since you are reading this in *Acorn User*, you probably have some knowledge of the machine's capabilities already, but the considerations for business users are rather different from those of the enthusiast.

To begin with you are aiming for a profit so the time you spend on computing costs you money. Since you (or your employee) could be doing something else, you need a simple system which does not take up too much of your time.

You need 'off the peg' programs that you can run with little knowledge: even if you are keen and knowledgeable about computing, your staff are unlikely to share your feelings. Finally you need reliability, above all.

If you are self-employed, even if only part-time, then you may be able to get some tax relief on the cost of running the system – provided that it is 'wholly and exclusively' used for your business.

You should first consider your business to see in which ways a computer would be useful and repeated surveys show this to be in the following areas: the wordprocessor, the database, the spreadsheet, and various special programs including accounts packages in roughly that order.

This is not the place to guide your choice of products, which can, of course, change very quickly, but rather to give you an idea of what factors to take into account when you are making your choices.

Your needs

You should look at what you do, and remember – each business is unique. Try writing down a list of what you have done in the last month: the letters (and were there several the same?); the records of purchases, sales and stock; any printing or advertisements you have prepared; any calculations you have made – and did you use a calculator? If so what for? Now do the same for anyone who helps you with the work.

If your list makes you think that a computer can help you – and your business is not too large – then you should consider what a BBC micro can do. But do remember that if you employ more than 25 people you are probably already too large for it to be a wise choice. On the other hand, a part-time worker with a typist/book keeper for one day each week could probably break even.

The object is to get the same work done in less time either to free you for more profitable activities, or else to give you more leisure: the choice is entirely up to you.

Equipment

What sort of system should you be considering? Starting with the micro itself the simple answer is the BBC B+ which is fitted with a disc filling system (DFS). I share the view of Vincent Fojut (DFS review, July '85) that choosing a standard DFS saves problems later as new software appears.

The next choice concerns the disc drive (which is essential), and the idea is twin disc drives which have their own power supply, double-sided with the facility of switching between 40 and 80 tracks using standard 5 1/4in discs. For more information see the guide to disc drives by Bruce Smith in the July '85 issue.

The ease of copying is particularly important to a business user, because to lose the data on the disc can be devastating if it happens to be your order book, list of customers or record of transactions. It is essential that you keep three full copies of all your work and up-date them daily after any alterations, by systematic copying. Anyone who has lost a complete address book of 120 names, as I have, and then had to spend a week recovering entries from the wreckage will appreciate this fact.

Most of the uses (particularly wordprocessing) require someone to read the characters on the screen for long periods, and that calls for a high resolution monitor rather than a domestic television – in any case you may be committing an offence if you employ someone to operate the system in such a way that it could damage their sight.

You must choose between a monochrome monitor (which in practice means an amber or olive green screen) and a colour monitor; in either case between 12in and 14in diagonal for size. The main differences are of cost and weight: a 14in colour monitor would cost and weigh about four times as much as a 12in monochrome set. Unless you are going to use graphics from the start I would suggest a 14in amber monitor with the highest resolution you can get. If you plan to use any graphics, or money is not too tight, then pay the extra for a colour monitor of the same size, making sure that it is an RGB (Red, Green and Blue) set, which describes those with the best circuitry to produce high resolution.

You then come to the most difficult choice of all – what type of printer to buy – and here the answer lies in knowing what you are going to do with the system. There are many different types on the market at present, and an even larger number of makers, many of whom will probably disappear over the next few years when spare parts get difficult to obtain.

The main kinds are the dot-matrix, the daisywheel (with or without a keyboard) and the ink-jet.

The dot-matrix prints a group of dots in patterns which create characters, but equally can produce any other kind of image including graphs and diagrams.

It is fast, but gives the distinctive 'computer' print which may not convey the best image for your business if used for outside letters or publicity material since it is obviously mass produced, although this can be greatly improved by using an NLQ (Near Letter Quality) mode, assisted by one of the many printer drivers which are available for most, but not all, such printers. Indeed, I recommend that you should not even consider buying a dot-matrix without the NLQ facility.

The ink-jet system has much in common with the dot-matrix but has the benefit of better colour reproduction.

For almost everything that a traditional

typist would do, the daisywheel printer produces the 'perfect' copy (although more slowly), and although it is possible to get connections to an electronic typewriter I suggest a separate machine with an identical typeface would be better. Watch, however, to see that it does not a use a typeface with the distinctive zero character, which identifies it as a computer output (if that matters).

It would also be better to choose one with the capability to provide proportional spacing, since that produces a more professional output. Naturally, with a daisywheel you can always change the wheels. It is also useful to have a printer which can take either single sheets, or special continuous stationery for long print jobs.

How should you choose? If you are content with the distinctive look and want any kind of diagrams, enlarged characters and speed, then choose the dot-matrix with NLQ, or the more expensive ink-jet type (if you want good colour). If you want top quality typed material and high reliability, go for a daisywheel.

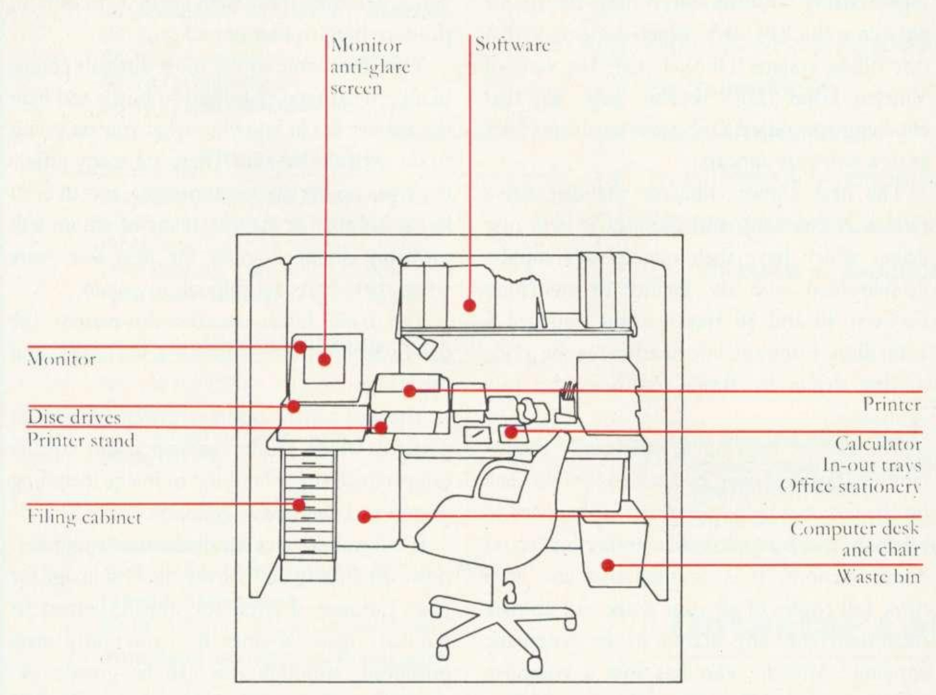
Once you have made that general decision, take a sample of typical work along to the dealer – on the largest size of paper you will use and containing zero and £ characters – and insist on seeing it printed out.

The point about the £ character is that many printers use the USA character set in which ASCII code 35 gives a #, and they need special handling to produce £ signs with the natural keyboard stroke. So, if this is going to be a problem it is better to know in advance.

You will need a place to keep your system, a firm table top (or better still a work station) at least 100cm x 75cm and a comfortable chair. Choose a place where the system doesn't need to be moved often and where there is not too much dust around. For ease of use try to avoid having the sun shining on the screen.

It is worth buying from a large, well established specialist dealer, not too far from where the system will be used – even if this does work out a little more expensive. You are going to need help occasionally and repairs and maintenance will have to be carried out and if you have bought your system all in one place, at least you reduce the risks of buying incompatible hardware. Unfortunately, with more general dealers, that is not always the case.

The cost of all this is likely to be in the range from £1200 to £1900, depending on your choices. Over the next few months we will explore the software you need to make the system pay, and the kind of work which can be expected of it.





Many thanks to the following suppliers for lending us equipment:

BBC in Oak box, Oak, PC Model 5 – £950 + VAT (see Business Cover). **Disc Drive,** Ahkter, Dual Disk Drive, MD802D – £286 + VAT. **Monitor,** Technomatic, High-Res 1441 – £389 + VAT. **Clear printer stand,** Viglen Computer Supplies, 490 Printer Stand – £16.95 + VAT. **Printer,** Star, Dot Matrix, SD10 – £389 + VAT. **Panel-based workstation** (including desk and chair), Workbase, Office in a Box, Configuration 20 – £650 + VAT, (range from £500 – £700). **Monitor anti-glare screen,** Watford Electronics, safety screen – £13 + VAT. **Acorn User binders,** Acorn User Services, PHS Mailing. **Software,** various titles supplied by Computer Concepts, Gemini Marketing, Contex Computing, Meadow Software. **Office equipment,** various, supplied by Ryman Ltd.

Oak Universal Ltd, 20 Crofters Green, Green Lane, Idle, Bradford BD10 8RR. Tel: (0274) 614167. **Akhter Computer Group,** 28/29 Burnt Hill, Harlow, Essex CM20 2HU. Tel: (0279) 443521. **Technomatic,** 17 Burnley Road, London NW10 1ED. Tel: 01-208 1177. **Viglen Computer Services,** Unit 7, Trumpers Way, Hanwell, W7 2QA. Tel: 01-843 9903. **Star Micronics UK,** Craven House, 40 Uxbridge Road, Ealing, London W5 2BS. Tel: 01-840 1800. **Workbase Ltd,** Bumpers Way, Chippenham, Wiltshire SN14 6LH. Tel: (0249) 659196. **Watford Electronics,** Jessa House, 250 Lower High Street, Watford WD1 2AN. Tel: (0923) 37774.**Computer Concepts,** Gaddesden Place, Hemel Hempstead, Herts HP2 6EX. Tel: (0442) 63933. **Gemini Marketing Ltd,** Unit 21, Dinan Way Trading Estates, Exmouth, Devon EX8 4RS. Tel: (0395) 265165. **Contex Computing,** 15 Woodlands Close, Cople, Bedford MK44 3UE. Tel: (02303) 347. **Meadow Software,** 11 London Street, Whitchurch, Hampshire RG28 7LH. Tel: (025682) 2008. **Ryman Ltd,** Head Office, 59 Markham Place, London SW3. Tel: 01-351 5671. **Acorn User Services,** PHS Mailing Ltd, PO Box 14, Horley, Surrey RH6 8DW. Tel: (02937) 72206.

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THE TROUBLE WITH MY PACKAGE . . .

This month, the software packages that have raised most reader queries – and those with an apparently serious limitation – are examined

Edward Brown

Over the last few months I've looked at various aspects of the Z80 second processor, and in particular the wordprocessor program, *MemoPlan*. Throughout the articles, problems with the various software packages have been pointed out and cures for some of the problems have been given.

In this article I will cover the various software packages and what options are available for upgrading or improving those that are supplied with the Z80 second processor. Due to the quantity of software bundled with the Z80 and the time it takes to review each package, it has not been possible to examine every program in detail.

Some of the packages will be examined in more detail in future articles.

Next month, for instance, I will be looking at the two versions of Basic supplied with the Z80 second processor, most particularly at Mallard Basic.

To provide the best overview of what is available, I have concentrated on the packages about which I have had most correspondence and those with some serious limitation which has been highlighted.

The software that was examined was a full specification version of Mallard Basic from Locomotive Software, a full specification version of *Nucleus* from Compact Software, and upgrades of packages supplied with the Z80 second processor from Acorn.

The full specification Mallard Basic and *Nucleus* are available now (see below for details) and the upgrade pack of software from Acorn will be available sometime around the turn of the year.

MemoPlan

This package has been extensively upgraded to overcome most of the limitations previously present. The package now contains a much extended configuration program which allows the user to set up the editor as he or she wishes. This will avoid patching the programs and the CONFIG.DAT file to accomplish such things as colour screens and the use of different printer types.

The configuration program provides the facility to alter how the screen behaves, how the keyboard and swap file are used, and how the background printing is performed. The printing program MEMOP has been tidied up and now handles all the print options correctly. This, together with the way the printout can be controlled using the new CONFIG program, makes it a much more flexible printing system.

The real improvements lie in the MEMO program itself which has had several functions modified, upgraded or added as follows.

Underlining now appears on-screen as you type, giving a visual representation of what you will see on the printout.

It is possible, using the CONFIG program, to change the default setting of the highlight mode from 'underline' something else such as 'italics'. Those items that are underlined on screen will then be output in italics.

The main thing is that, whatever highlight is chosen – and it will normally be underlining – it is possible to see exactly what is affected on the screen.

The quote key (CTRL f1) has now been renamed 'new page'. When pressed, a down arrow is displayed on the screen to indicate where the new page will be and a CTRL Z character is placed in the file. This means that, when the document is printed using MEMOP, a page will appear in place of the down arrow.

One of the two blank function keys, CTRL f6, has been assigned the function of providing information on the files on disc. When CTRL f6 is pressed, a drive or file specification is requested, and files which match this specification are displayed. This means that, when you want to read or write a file but can't remember it's name, you can look it up without having to come out of *MemoPlan*.

The naming of files has also been improved. Only legal filenames will now be accepted, so you no longer cause yourself problems by saving an edited document with a name that cannot be accessed from the CP/M command level.

The many control sequences which used to be available from the keyboard and which produced strange results have now been tidied up so that they are no longer available. Now, if you type any control character that isn't documented, an error is generated.

Words can now be deleted forwards and backwards whereas previously they could only be deleted forwards.

If the command line length of 16 characters is exceeded when printing is requested from MEMO, the program no longer crashes, but instead gives an audible warning.

The occasional corruption of screen characters should also have been corrected. However, I was unable to generate this problem with my original copy of *MemoPlan* so could not check this.

Conclusion

The *MemoPlan* package has been tidied up and several new features added to enhance it. The new directory facility and the complete configuration program are particularly welcome. The latter will help to solve a great many of the problems readers have been experiencing.

BBC Basic

The new version of BBC Basic cures the ACS and ASN function bugs which caused PI to be missed out of the calculation. These now return the correct values. The computed RESTORE problem has also been solved.

Mallard Basic

Mallard Basic is the full specification version of the run-only Professional Basic provided with the Z80 second processor package. It allows programs to be created and altered interactively without a special program having to be written to save them in ASCII and then

editing carried out using *MemoPlan*. The package also allows lines to be edited by using the cursor keys, and insertion and deletion of characters.

A new manual comes with the package, which is an excellent reference source for the language. In addition to the Mallard Basic, a B-Tree file utility called JETSAM is supplied. This takes a lot of the headaches out of writing file handling programs.

The version of Mallard Basic supplied is 1.29. This is incompatible with earlier versions of JETSAM file handling, which means that earlier programs written using JETSAM will not run without modification; but this can be accomplished by one statement and is well documented with the package. The original Compact software can still be run under the original versions of Professional Basic supplied with the Z80.

Nucleus

Nucleus, as supplied with the Z80, is a useful program generator. Its main drawback is that, once an application has been generated, it cannot be altered. So once you've designed and generated your program, if you want to position things differently on the screen you have to regenerate the application from stage one. The upgraded version of *Nucleus* overcomes this limitation by allowing you to return to a previously defined program and alter the screen and file layouts. This greatly enhances its usefulness.

The methods of specifying sorting have been improved, so that it is now possible to sort by date.

Multi-line sort criteria are joined by 'AND' instead of 'OR'. Before acquiring the update of Mallard Basic or *Nucleus*, check with Compact that programs generated by *Nucleus* will be compatible with the version of Mallard Basic you intend to run under.

Accountant

Some early versions of *Accountant*, supplied with the first 500 Z80 second processors, contained bugs relating to VAT calculations. The updated version has been supplied with the preview discs. I doubt, though, whether it will be included in eventual release as there should no longer be any faulty *Accountant* packages in circulation.

GraphPlan

This package has been upgraded in a number of areas and the most prominent of these are as follows.

Zero values are now displayed on graphs. A number of faults in the printing routines have been put right, and *GraphPlan* will now print on Olivetti printers. Filenames have been given the same treatment as in *MemoPlan*. And the various places where the screen was not updated with new information when it was altered have been corrected.

FilePlan

This package has received the same treatment as *MemoPlan* and *GraphPlan* in the area of file handling, along with some updating in the area of file deletion. The 'help' information can now be displayed without deleting the main menu. Output from the package has been improved, and the production of labels and merging with *MemoPlan* documents now work much better.

Summary of improvements

MemoPlan
Underlining on screen; directory function; 'New page' replaces 'Quote'; filenames checked for validity; redundant control keys disabled; print line options work correctly; command overflow in MEMO doesn't crash the system; CONFIG program expanded; easier to specify printer; easier to configure *MemoPlan* for own use; and easier to control format of print-out.

FilePlan
Menus remain on screen during 'help'; files can now be deleted and reused; and reports can now be deleted.

GraphPlan
Zero values now plotted; filenames checked for validity; and files now removed from directory when deleted.

Nucleus
Sort on date now permitted; multi-line sort criteria joined by 'AND' instead of 'OR'; file handling more flexible; and generated progress can be easily altered.

Accountant
VAT bugs cured.

BBC Basic
ASC and ASN bugs cured; and computed RESTORE bug cured.

Mallard Basic
Full specification version 1.29 available, which allows interactive program development.

What's in the packages

Mallard Basic version 1.29: Full specification Mallard Basic interpreter which allows full interaction for program development. Comes installed for the BBC micro and includes the run-only version.

Nucleus: Full specification version of *Nucleus* that allows the alteration of screens, files and programs once they have been defined.

Acorn upgrade pack: Contents not yet defined, but will include an upgraded *MemoPlan*, BBC Basic, *GraphPlan* and *Accountant*.

If you have any problems, advice or suggestions regarding CP/M, write to Edward Brown c/o CP/M Corner, Acorn User, 68 Long Acre, London WC2E 9JH.

USEFUL ADDRESSES

Locomotive Software, 1 South Street, Dorking, Surrey RH4 2DY. Tel: (0306) 887902.

Compact Software International, 1 Paper Mews, 330 High Street, Dorking, Surrey. Tel: (0306) 887373.

Acorn Computers, Fulbourn Road, Cherry Hinton, Cambridge, CB1 4JN. Tel: (0223) 245200.

CORRECTIONS

In the October article on *MemoPlan*, a number of errors crept into the text. The following corrections should be made.

Page 128:

The bytes to alter for different colours that appear in the third column should be A24H, A2AH, A30H and A36H.

I did not provide any instructions for the INTIP program that was supplied in the article. This program should be typed in using MEMO in the line mode and then saved with the extension ASM. It should then be assembled using the assembler ASM (see section 3 of the CP/M 2.2 with GSX Graphics manual) to create an Intel Hex file with the extension HEX. This is then loaded with the LOAD utility to form a COM file. Now it is possible to run the program by typing INITP.

For those who want to alter this program for their own printer, the following should be noted. All the strings for output consist of two parts. The first part up to the $ is output to the printer, and the second part after the $ is output to the screen. To change the initialisation strings for your own printer, only the first part should be altered. If further initialisation commands are required then:

1) extend the INIT: string to include the new command:

2) add an extra compare and call into the sequence following MODE:

3) add the appropriate string into the MSG table below INIT:

4) add a further subroutine to output the string.

On some printers it is necessary to output the $ character. With these, change the second line of the PRINT: subroute to compare with a different value and to change all the printer terminators to the new character. The printer terminator is the first $ in the strings.

CP/M CORNER

Edward Brown and Richard Clement

ALIVE AND WELWYN

I recently had the pleasure of addressing the Chiltern Branch of the CP/M UG (UK) in Welwyn Garden City. I was pleased to find an audience of some 40 people prepared to listen to me ramble on about the Z80 second processor and CP/M.

Many of the questions were all too familiar and pointed me in the direction of future articles. To all those who attended, a hearty thank you. Over the coming months, I will deal with your various points. Keep the questions coming – they will all be answered eventually. Some just take more solving than others.

USEFUL DUMPING GROUND

During the course of the *Acorn User* Show, I had the chance to experiment with a number of programs for both the Z80 and the Beeb. One utility of particular note for Z80 processor users is *Acorn User's* own *UserDUMP* ROM. This allows you to dump screens to a printer, and was used to produce screen dumps of pictures created on the Z80 second processor.

JUST AN ECHO IN THE PRINTER

From the CCP, it is possible to type CTRL P – then everything typed on the console is echoed on the printer. This is useful for getting hard copy of the directory of each disc or the sizes of each file for future reference. However, once an application program is loaded, this feature is often disabled – so one can't get copies of application program screens.

One way round this is to modify the BIOS jump vector so that when a character is sent to the console, it is also sent to the printer. This is achieved by replacing the console out-jump with a call.

The printer out-jump then follows directly after the console one, and the character held in register C is not corrupted. Four short programs are shown here which turn this console echo facility on and off. Notice that two are written in BBC Basic and two in Mallard Basic.

```
   10 REM Echo screen to printer
   20 REM by Edward Brown
   30 REM for BBC with Z80
   40 REM (c) Acorn User Dec 85
   50 :
   60 BIOSVECT=&H1
   70 CALLVAL=&HCD
   80 BIOSLO=PEEK(BIOSVECT)
   90 BIOSHI=PEEK(BIOSVECT+1)
  100 CONOUT=BIOSHI*256+BIOSLO+9
  110 POKE(CONOUT),CALLVAL
  120 PRINT"Echo enabled on retu
rn to CCP level"
- 130 SYSTEM


   10 REM Echo screen to printer
off
   20 REM by Edward Brown
   30 REM for BBC with Z80
   40 REM (c) Acorn User Dec 85
   50 :
   60 BIOSVECT=&H1
   70 JUMPVAL=&HC3
   80 BIOSLO=PEEK(BIOSVECT)
   90 BIOSHI=PEEK(BIOSVECT+1)
  100 CONOUT=BIOSHI*256+BIOSLO+9
  110 POKE(CONOUT),JUMPVAL
  120 PRINT"Echo disabled on ret
urn to CCP level"
  130 SYSTEM


   10 REM Echo screen to printer
   20 REM by Edward Brown
   30 REM for BBC with Z80
   40 REM (c) Acorn User Dec 85
   50 :
   60 BIOSVECT=&1
   70 CALVAL=&CD
   80 BIOSLO=?BIOSVECT
   90 BIOSHI=?(BIOSVECT+1)
  100 CONOUT=BIOSHI*256+BIOSLO+9
  110 ?CONOUT=CALVAL
  120 PRINT"Echo enabled on retu
rn to CCP"
  130 *CPM


   10 REM Echo screen to printer
off
   20 REM by Edward Brown
   30 REM for BBC with Z80
   40 REM (c) Acorn User Dec 85
   50 :
   60 BIOSVECT=&1
   70 JUMPVAL=&C3
   80 BIOSLO=?BIOSVECT
   90 BIOSHI=?(BIOSVECT+1)
  100 CONOUT=BIOSHI*256+BIOSLO+9
  110 ?CONOUT=JUMPVAL
  120 PRINT"Echo disabled on ret
urn to CCP"
  130 *CPM
```

Four programs for turning the console echo facility on and off

GRAPHPLAN PRINTING PROCESS

A number of readers have asked for help to use different printers with *GraphPlan*. Acorn supplies device drivers for Epson and Okidata printers with the GSX package and to use any other printer presents a problem.

First, see if your printer can be made compatible with one of these printers. If it can, edit the file ASSIGN.SYS according to the instructions in the addendum to the user guide and the printer should work.

If your printer cannot be made compatible with either the Epson or the Okidata printers you need a specialised device driver for your printer.

This is liable to be expensive, as it will have to be written specially for you so you should try contacting existing software distributors to see whether they have a device driver 'off the shelf' that will suit your printer. If this fails then contact a software house and ask how much it would cost to develop a device driver for your printer or plotter.

Once you know the cost you can decide whether to proceed or not – you might very well find it a lot cheaper to buy a different printer rather than have a device driver specially written for you.

We will cover GSX more fully in a future article, but until then if you require further information contact Digital Research.

BULLETIN BOARD ACCESS

A version of the *UKM7* communications program already installed for the BBC is now available from the CP/M UG (UK) library. This program will enable people to access bulletin boards around the country as well as the bulletin board run for CP/M UG (UK) members.

PROGRAM CHALLENGE

Davis Rubin Associates have recently sent me a new set of discs for their *Free Software Handbook*.

It is now possible to run all the Basic games using the Mallard Basic supplied with the Z80 second processor. STRTRK – which was originally written in OBasic – will run, but is not totally correct and should prove an interesting challenge to all those who program. Let me have a copy when you've got it working. The other programs on the disc have been customised for the BBC micro screen and now work such better.

CP/M CORNER

Edward Brown and Richard Clement

BBC USER GUIDE UPDATES

The following updates for the BBC Microcomputer System Z80 Second Processor User Guides have been released.

CIS/COBOL with Animator and Forms-2 User Guide 0409,000 Issue 1:

page 2-35 Table 3-2. CRT Cursor Control Keys. Delete: 'first key entry "Ctrl ^"; insert 'Copy'

CP/M 2.2 with GSX Graphics User Guide 0409,001 Issue:

page J-5 Faults and Events (third line from bottom of page). Delete: 'instructions'; Insert: 'instruction'. Delete: 'EI; enable interrupts, RETI; return from maskable interrupt routine'. Insert: 'RET; return from subroutine'

page J-7 LPT: the printer. Delete: '. . ., ignoring linefeeds . . .'; Insert: '. . . with no ignore character . . .'. Add to end of paragraph: 'UL1: is the same as the LPT: device except that no messages appear if a printer is not connected or if it is not on line. The system will hang waiting for a printer to be connected or put on line.'

Z80 BBC Basic User Guide 0409,003 Issue 1

page 12 Sixth line. Delete: '*DRIVE d'; Insert: '*DRIVE d:'

Memo Plan User Guide 0409,005 Issue 1:

page 50 Printing the current document. Add to last paragraph: 'However, the total length of the line – including space – must not exceed 16 characters.'

page 51 Fifth line down. Delete: 'Type -5 -P -PAGE 3 RETURN'; Insert: 'Type -5 -PAGE 3 RETURN'

page 9 The Screen. The 'T's shown in the screen illustration are deleted and replaced by hyphens, so that it now looks like this:

<---------------->---------------

Ruler line. Delete: 'T shows the position of a tab stop'; Insert: 'T show the position of a tab stop (not shown in screen above)'. See pages 16 and 24 for tab information.

page 53 Interrupting printing now reads:

'Type

CTRL C to stop printing and go back to the A> prompt

CTRL Z to stop printing and go back to the A> prompt

CTRL G to stop printing and go back to the A> prompt

CTRL S to pause

To continue after a pause, press any key.'

page 54 Printing without entering *MemoPlan*. Last paragraph now reads: 'The options are the same as in ordinary *MemoPlan* printing, with the addition of -P. This option makes the printer pause at the end of each page (to give you time to feed sheets of paper in).'

Accountant User Guide 0409,008 Issue 1:

page 117 VAT reports – option 4 Purchase daybook program menu VAT summary report. Delete: 'output tax'; Insert: 'input tax'. VAT detail report. Delete: 'output tax'; Insert: 'input tax'.

Let me know of any other misprints or errors you have found. I will list them as they are received.

SCREENING ACROSS THE TUBE

```
   10 REM Save & Load Screen Memory
   20 REM by Bruce Smith
   30 REM for BBC micro and Z80
   40 REM (c) Acorn User December 1985
   50 :
   60 MODE 1
   70 PROCscreen
   80 DIM block% 20 , buffer% &5000
   90 himem%=FNgethimem(FNgetmode)
  100 ?block%=13
  110 block%?1=1
  120 block%!2=himem%
  130 block%!6=buffer%
  140 block%!10=&8000-himem%
  150 block%?12=1
  160 X%=block%
  170 Y%=block% DIV 256
  180 PROCsave
  190 PRINT"Press key to load screen" : K%
=GET
  200 CLS
  210 PROCload
  220 END
  230 :
  240 DEF PROCscreen
  250 C%=1
  260 FOR N%=0 TO 400 STEP 100
  270 MOVE N%,0
  280 MOVE 1000-N%,N%
  290 PLOT 85,500,1000-N%
  300 GCOL 0,C%
  310 C%=C%+1
  320 NEXT
  330 ENDPROC
  340 :
  350 DEF PROCsave
  360 A%=&FF
  370 CALL &FFF1
  380 OSCLI("sa. screen "+STR$~(buffer%)+"
+"+STR$~(&8000-himem%))
  390 ENDPROC
  400 :
  410 DEF PROCload
  420 block%?12=0
  430 OSCLI("lo. screen "+STR$~(buffer%))
  440 CALL &FFF1
  450 ENDPROC
  460 :
  470 DEF FNgetmode
  480 A%=&87
  490 =USR &FFF4 DIV &10000 AND &FF
  500 :
  510 DEF FNgethimem(mode)
  520 A%=&85
  530 X%=mode
  540 =USR &FFF4 DIV &100 AND &FFFF
```

Listing 1. Demonstrates screen saving and loading using OSWORD and OSCLI

Some readers have been adapting their standard BBC Basic programs to run on the Z80 version of Basic. Problems have occurred when trying to save the screen memory using *SAVE, and re-loading it with *LOAD. Using these commands across the Tube is not possible, so screen memory must be transferred to or from the Z80 memory before it can be saved or loaded.

This is done using an OSWORD call with A% set to 255. The OSWORD parameter block is pointed to by X% and Y% and is arranged as follows:

XY + 0 = 13
XY + 1 = 1
XY + 2 = HIMEM
XY + 6 = Load address in Z80
XY + 10 = &8000 – HIMEM
XY + 12 = 0 to write / 1 to read

In the case of the relocation address in the Z80, it is worth using DIM to reserve the correct number of bytes – DIM buffer% &5000 – for a 20k screen.

Once the screen memory has been transferred to the Z80, it can be saved using OSCLI; listing 1 demonstrates the technique.

The June 1985 issue (page 135) contains more details on the OSWORD 255 call and a more general transfer program.

COLOURFUL TEXT MADE EASY

Long spells spent at the keyboard can prove painful, eye-aching experiences even when using a high-resolution 80-column screen with white characters on black. Why not change the colours to reduce the strain? For example, in CP/M type the following:

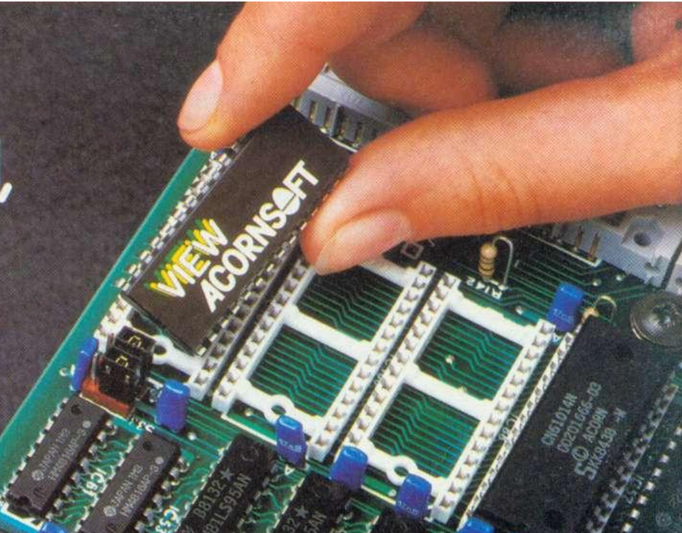
CTRL-S
CTRL-A
CTRL-S
CTRL-@
CTRL-@
CTRL-@

That is, keep one figner on the CTRL key and press S,A,S,@,@,@. Now the text turns yellow – much more pleasing!

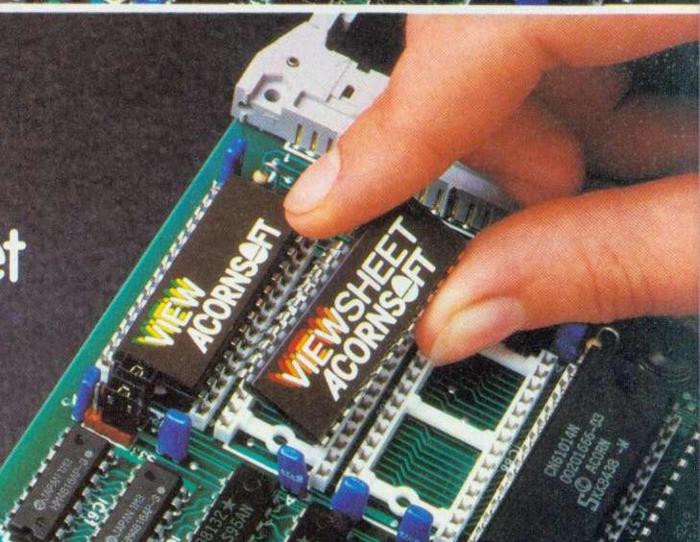
Here's a list of other useful colours that can be obtained in the same way:

Colour	CTRL sequence
Yellow	SAS@@@
Red	SAA@@@
Magenta	SAQ@@@
White	SAW@@@
Cyan	SAE@@@
Blue	SAD@@@
Green	SAE@@@

"VIEW handles very well, and is certainly the best word-processing system of its size..." Practical Computing.



"......probably the most sophisticated spreadsheet yet developed on a home micro..." Accountancy Age.



"ViewStore achieves that highly desirable objective-of being powerful and easy to use..." A & B Computing.

Why everyone's so happy to express their point of view.

The View range is the largest range of software available for the BBC Micro. Ind the most sophisticated.

Hardly surprising, since the View range comes from Acornsoft, and is lesigned to use the capabilities of the BBC Micro rather more fully than any other software package. Indeed, VIEW was awarded the 1984 British Microcomputing Award for home software.

The View range also includes ViewIndex, ViewSpell, ViewPlot and a Printer Driver Generator, all of them powerful, sophisticated and, above all, friendly to use.

Why not fill in the coupon (or call us on 0223 214411) for more details? And then you'll be able to form your own point of view.

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Address ____________________

____

Post Code ____________________

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Cambridge CB5 8PD.

ACORNSOFT

INTEGRATION—THE FACTS

INTER-SHEET and INTER-CHART are the first of a new generation of integrated packages for the BBC Micro. They are more powerful and much easier to use than any other similar application program.

The ROM-LINK concept is unique to this range of programs; it ensures that all ROM-LINK programs are totally compatible and truly integrated.

The word 'integrated' has been much abused recently. In our eyes 'integrated' should mean that all programs in the range should share a common data format, that it should be possible to transfer data directly from one program to another (not just by saving and loading) and it should be possible to have multiple programs resident in the machine at once. The integrated programs in the ROM-LINK series are the only ones that can do this.

The ROM-LINK system allows up to 16 packages to be resident in memory at the same time. It makes no distinction between any of the packages, so that you could have up to 16 separate spreadsheets stored in memory or (more usefully) a few spreadsheets, a few graphs and a couple of documents being word processed. It is a simple matter to transfer data from any package into the one in current use, and because the packages are resident in memory, the data transfer is very fast. It is also possible to use data from other packages without actually transferring, thereby saving memory.

Put simply, this means that INTER-SHEET can use multiple spreadsheets and use data from one sheet in another sheet, and INTER-CHART can plot graphs using data taken directly from a spreadsheet. When INTER-WORD and INTER-BASE are available then these will be able to use data from the other packages in the same way.

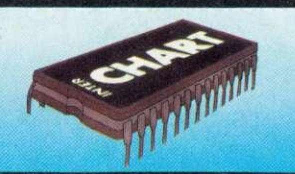
FACTS

INTER-CHART

The chart and graph plotting program

This general purpose graph and chart plotting program allows the user to display data in the most easily understood manner—graphically.

Two quite distinct sorts of graphs are catered for. 'Labelled' graphs that always have fixed increments on the X axis like yearly sales figures, and 'scaled' or scatter graphs. These allow both the X and Y values to be specified.



Data can be entered into the system from three distinct sources: Typing at the keyboard is the simplest method, but data can be read from ASCII files produced by WORDWISE, VIEW or a programming language such as BASIC. Because INTER-CHART is ROM-LINK compatible it can also import its data directly from other ROM-LINK packages such as INTER-SHEET.

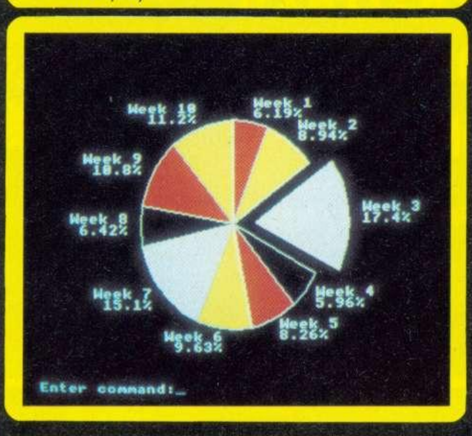
Once the data has been entered a straightforward editor allows any previous data to be altered or new values to be inserted at any position.

TEXT WITH GRAPHS: Labels are normally printed along the X-axis for lines and bars. Pie charts have their labels and values printed around the chart. These may be optionally switched off. With a pie chart the values may be replaced with a percentage figure. All graph displays can have additional labels or messages printed at any position on the screen using a powerful label editor. This allows headings to be easily added to graphs. These labels are stored with each graph when saved.

COMPATIBLE WITH: All shadow RAM boards and the 6502 2nd processor. However the ROM-LINK facilities are not available when using a 2nd proc., these include multiple INTER-CHARTS and direct data transfer from other ROM-LINK programs.

PRICE: £36.80 incl.

INTER-CHART allows up to 16 graphs to be held in memory at the same time as one 'package'. Each graph is named and, once entered, any named graph can be selected from a simple menu display.



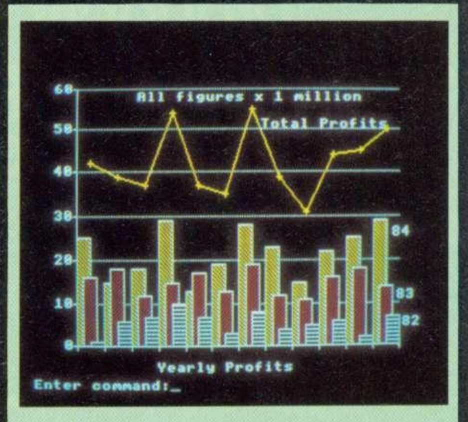
SCREEN DISPLAY: The graphs can be displayed in any of the BBC's graphics modes. The colours of the bars, lines or segments can be altered in a simple table of colours. This also allows special striped colour combinations and for bar charts a variety of cross hatching styles is available. It is also possible to use a VDU19 statement to alter the colour palette.

DISPLAY OPTIONS: Where appropriate (not pies, etc) either axis can be displayed as a log or linear scale, and there is an option to display dotted graduation lines on either axis. Pie segments and bars can be highlighted (segment 'pulled out').

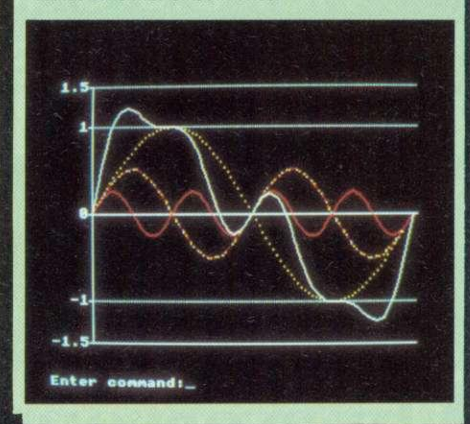
PRINTERS: INTER-CHART has a built in screen dump routine for all EPSON matrix printers and compatibles. It is possible to use other screen dump routines from within (or external to) INTER-CHART for other printers or plotters.

FILING OPERATIONS: Any named graph can be saved or loaded individually to disc or cassette, or all graphs can be saved together in one file.

GRAPH TYPES: INTER-CHART supports the three main graph types, lines, bar charts and pie charts. Scatter graphs are also catered for and can be displayed as points or lines.



SCALING: INTER-CHART automatically scales the graph display to cover the full range of values entered. INTER-CHART can cope with numbers in the range 2E-39 to 2E+38. It is possible however to force the scale independently on the X and Y axis to show any specified range, including the option for log scales on either or both axes.



FUTURE RELEASES

Both INTER-SHEET and INTER-CHART are available now. INTER-BASE and INTER-WORD are under development at the moment, and are likely to be released in early 1986. Both are fully ROM-LINK compatible so that they will be totally integrated with the others in the range.

INTER-WORD is an 80 and 105 column word processor (not 40 columns). This will be a 'WYSIWYG' word processor showing the page on screen exactly as it would appear on the page, including page breaks, headings/footings and centered lines, justification, margins, etc. It will also handle 'continuous' documents on disc up to the capacity of your filing system.

Like all of our products this will be smooth and very fast in operation, and of course very easy to use. Editing operations will be similar to WORDWISE but this is not totally WORDWISE compatible. There will be an exchange arrangement available to WORDWISE owners—more details available nearer the release date.

AVAILABILITY: Winter 85/86
PRICE: Approx. £49.00 + VAT

INTER-BASE will simply be the most powerful database available. This will operate with all disc filing systems and have a very large data handling capacity. It will contain a powerful BASIC-like programming language with full string and mathematical operations.

This will work at 2 levels, a simple user interface will allow card-index like operations but, via the programming language, the system can be easily tailored to the individual needs. Up to 250 fields per record, each field up to 32K long. This would enable the user to store complete documents in the database. Variable length fields and records.

AVAILABILITY: Early 1986
PRICE: Approx. £59.00 + VAT

EDUCATION

NEWS

Course plotting in the classroom

The Plotmate Plotter and *Qmap* software combine to produce a tool which can be use in many school situations, including geography, history, social sciences and biology classes, where it is helpful to be able to produce maps and plans that show data in symbolic form plotted against an outline.

The *Quest* database from AUCBE (the Advisory Unit for Computer Based Education in Hatfield) has been with us for some time now and is used in many schools throughout the country. Data files come with it, on topics as diverse as horses, bowls, chemical elements and records of criminals transported to Tasmania. Or it can be used with the data children have recorded for themselves. It has proved to be a robust and well-constructed package and is flexible enough to fulfil a wide variety of applications, including producing frequency distributions of numeric data, mail labels, scattergrams and barcharts. The machine code version, *Questd*, is able to handle larger data files as it is a disc-based random access package. Fundamentally, though, its method of use is the same as *Quest*, the same commands being employed for handling the data.

To these two packages has been added a third which provides some very interesting features for classroom teachers. Called *Qmap*, this program allows the creation of maps and plans onto which may be superimposed signs and symbols relating to data held in *Quest* files. To quote from the handbook: 'It is possible to:

*Create a correctly scaled distribution map with choice of 4 symbols of the result of any *Quest* or *Questd* search on geographical data.

*Compare the mapped results by altering the size and position of the map and putting two or more maps on screen at the same time.

*Label each of the mapped points, add a title and scale bar.

*Print copies of the maps exactly as they appear on the screen, or obtain a copy on a plotter.

*Make your own base maps for your own *Quest* or *Quesd* data.'

The maps may be produced either by using a British micro Grafpad or the AMX Mouse. The output can be either to a printer or a plotter. The problem with dot matrix printer output is that, although the results are acceptable, they always look like computer-printed material. Using the Plotmate plotter provides a different finish altogether (see Joe Telford's review on page 179).

A plotter works on the basis of an arm which moves in two orientations in order to cover the whole paper. Attached to the arm is a pen which is raised and lowered according to the computer's directions. The use of a pen rather than a matrix of pins and a ribbon gives the appearance of high-quality draughtsmanship – output from such plotters, on a larger scale, is used to produce plans, engineering drawings and maps in a wide variety of industries. The Plotmate works quite simply by following the standard BBC micro plotting instructions such as MOVE, DRAW and PLOT in exactly the same way as drawings are plotted on the screen. This is not a screen-dump. These work by copying pixels from the screen on a row-by-row basis. The Plotmate produces actual line drawings in a variety of colours, simply by changing the pens when prompted. Hence the high quality.



A robust, well constructed and flexible package, ideal for the schoolroom

Using the *Qmap* program is simplicity itself, provided you have suitable *Quest* files available – there are several provided with the package – and you can operate the plotter. All this involves is connecting it to the user port and switching it on. Once the hardware is set and the software loaded, the base map can be loaded, followed by the data to be plotted. The map may then be drawn on-screen, titled and scaled. The data can be added in one of four forms – a cross, a triangle, a diamond or a square. The map may be moved to one side of the screen and another map added beside it; the data points may be labelled with a set of letters or numbers; and, finally, the map may be re-displayed at a different size to focus on one particular area, with the related data being plotted on a scale with the map.

Of course, this is not the only application for the Plotmate. Any program which uses the standard BBC graphics commands may be adapted to produce output on the plotter. So graphs, charts, plans and maps may easily be created as well as more intricate engineering or artistic drawings.

The Plotmate represents good value for money, especially considering its ability to interface with *Quest*. The photograph shows Plotmate in use on a primary school project. It is presenting, in an easily understandable graphic form, a mass of data on local weather changes which was collected by the children over a four-week period. This item of hardware has been approved for use by the Inner London Education Authority and is recommended by advisers in many other LEAs as a desirable item of equipment.

Quest and *Qmap* are available from AUCBE, Endymion Road, Hatfield AL10 8AU. Tel: (07072) 65443.

The Plotmate plotter is available from Linear Graphics Ltd, 28 Purdeys Way, Rochford, Essex SS4 1NE. Tel: (0702) 541664.

Commentary by Nick Evans

NEWS

Calling all schools and BBC software packagers – we want to hear what you have to say

Beginning next month, this column will feature a regular series on school administration packages for the BBC micro. We will try to cover as wide a range of topics as possible, including timetabling, options, cover lists, examination entries and results, markbooks and any other applications that are useful in teaching or school administration.

Many companies that produce software of this kind have been asked for information for the series, but it may be that your company has not heard from us. If this is the case, please contact us at *Acorn User* and give us the chance to feature your package in future issues.

We would also welcome feedback from schools on how useful or otherwise they have found the packages to be, any improvements they would like to see made, and features they feel should be added.

French lessons without tears?

I have a particular interest in modern languages, at this is my own subject.

Consequently, my attention is immediately grabbed by information about new programs for French teaching – especially in the light of a comment from one adviser, who told me that there is no real application for computer technology in the teaching of modern languages.

MedStat Ltd have come out with *Le Vocab* and *La Conjugaison*. The former covers vocabulary in 191 topic-based units embracing 5000 words, while the latter covers 50 regular and irregular verbs in 17 tenses.

As MedStat didn't send me a copy of either, I cannot tell you whether a lower ability pupil would be able to find his way through that mass of information to something useful for himself; but hopefully I shall learn more about this package in the future. For further details, contact MedStat, City House, Maid Marian Way, Nottingham NG1 6BH. Tel: (0602) 411120.

Teacher's choice

Still on the subject of small producers of software – many of whom produce very fine products despite the small scale of their operation – I receive a good deal of review and advertising material from software houses that have been set up either by individual teachers or consortia of teachers aiming to fulfil their own needs in the classroom and hoping to do the same for others. This is often very successful, as teachers are in a much better position to know classroom needs than commercial publishers and some interesting titles have come my way from such sources.

The infant *Maths Series* from MRH Software is one. It is designed to develop in three to six year olds the concepts of size, shape and position. All the programs develop the skills of perception and sequencing which are so essential during the pre-reading stage.

MRH also produce a Reading and Language Development series aimed at nursery, infant and ESN children. It deals with word recognition (all in big infant print), handwriting, matching, sentence completion and prepositions. These programs are available on disc at £9.95 or tape at £7.95, from MRH, 20 Highfield Road, Kidderminster, Worcester DY10 2TL.

Another company with a useful package is Strawberry Fair, which market a variant on the *Janeplus* program. In this, a machine acts on a pair of numbers to produce a result, and the child must work out which function the machine is performing.

Golfer provides help with estimation of angles and *Scales* gives similar assistance with the concept of length. These are available on disc at £10.25 or cassette at £8.95, from 15 Walker Road, Portsmouth PO2 8PQ.

More about small companies next month.

Meyer muse-ings

Richard Meyer from London writes in response to my answer to John Willett's letter in July's *Acorn User* about the reluctance of publishers to look at school software.

He says: 'I read your article and was surprised to see no mention of MUSE (Microcomputer Users in Secondary Education). MUSE markets teacher members' programs and is run by teachers for teachers.

John Willetts should send his software to MUSE, PO Box 43, Hull HU1 2HD.'

User wise

It is always heartening to hear of a software house which is willing to update its program in response to information received from users. This is not usually possible with large companies. With Peter Sharp Software the documentation states: 'The author would appreciate feedback from educational establishments . . . If you also return our program with the data, the new information will be incorporated and your program returned by return.'.

This relates to a program about the Periodic table of the Elements and their relative melting and boiling points. He acknowledges that all data about the elements is not known, and asks users to help him keep up-to-date with progress. Improvements in style, presentation or information can then be incorporated.

The program is available on 40 or 80 track disc, price £4.95, from Peter Sharpe Software, Llwydfan, Minffordd Road, Penrhyndeudraeth, Gwynedd LL48 6AU. Tel: (0766) 770528.

EDUCATION TOP FIVE

	Title	Publisher	Cassette	Disc	ROM	Electron	Shadow on B+	6502	Econet
1	Music System	Island Logic	—	£29.95	—	—	Yes	—	—
2	Podd	ASK	£9.95	£11.50	—	Yes	Yes	—	—
3	Number Painter	ASK	£9.95	£11.50	—	Yes	Yes	—	—
4	French 'O' Level	Hill McGibbon	£14.95	£19.95	—	—	—	—	—
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CONTROL IN THE CLASSROOM

The education column this month looks at ways to use your school Beeb in the world of robots and computer control

Chris Drage and Nick Evans

Robots are becoming more numerous and finding varied roles in the world of adults, so computer control, measuring and metering is gaining importance in the primary classroom. But it is an area which, as yet, is sadly neglected.

There are at least three ways you can use your school Beeb for control purposes: as a sensor to read and display information from the outside world; as a switching device controlling aspects of the environment under instructions from an operator, and as an artificially intelligent device (still following operator instructions) encompassing changes in the environment which the computer senses and reponds to.

Timer and Meter – two packs developed by Ely Area Resource Office (EARO) and marketed by Educational Software for Microcomputers (ESM) – enable the computer to act as a sensor. The Meter pack displays the information in a variety of ways. *Timer* transforms the computer into a stop clock and event counter.

As a stop clock it can have four settings accurate to one second, 0.1 second, 0.01 second and 0.001 second. The event counter notes changes such as the number of times an electric circuit (or light beam) is broken.

The Meter pack measures changes in voltage or resistance through such devices as simple electric motors, potentiometers, voltmeters, thermistors and light-dependent resistors. The results may be displayed in large digits (000 to 0.000), as a simulated moving needle, or as a graph with a variety of time settings. Both packs provide considerable scope for discovery-based activities.

Timer offers a wide range of possibilities which can be quickly and cheaply implemented in the classroom. Using simple foil and crocodile clip 'switches' children are able to measure the time it takes objects to roll down a slope

Figure 1. A simple timing device

(figure 1). My class of 10-year-olds were keen to find out who had the fastest roller skate, matchbox toy, or whatever. Some children might realise that they can realistically time vertically falling objects and so open up the whole sub-topic of dropping things of differing shapes and mass from various heights.

Ideas sheets available from Sarah Bidwell at EARO (address below), suggest making a reaction timer. A 'light switch' can be made quite cheaply and provides another set of testing situations, for example, for calculating the speed at which a piece of card of known length passes the light switch, or to count the number of people passing along a corridor during a period of time. Reed switches and infra-red sensors provide many other timing possibilities.

The Meter pack prompts a multitude of activities once a light switch and a thermistor have been made. EARO can provide the parts for these on request.

Before any measurements take place, the thermistor/light switch must be calibrated. (My class did not understand why this should be so and a lot of discussion about units of measurement ensued.)

Children can use the thermistor to measure temperature differences across their hands and for finding the hottest part of the body – both at rest and after exercise.

Both Timer and Meter complement the science curriculm very well indeed and require a minimum of computing knowledge to operate. Each positively encourages the experience of first-hand discovery. The value of using the micro to monitor the type of events mentioned here is that the data collected is related to the children's direct experience.

Robots provide a wonderful opportunity for children to experiment with computer control. They are an excellent means to illustrate the potential of the computer, whether it be setting a turtle a predefined pathway to draw or sending the BBC Buggy off to collect something with its grab-arm and to return it. The important point is that programming a robot really makes children think about what they are doing and why; if the robot does not respond as expected then they have to re-examine and revise their work. Children learn by this type of activity because their awareness, use of language and mathematical concepts are all enriched. Angles, movement, direction, levers and fulcrums become very real indeed. The whole learning process is enhanced.

There are two types of robots suitable for educational use: robot arms which perform a mechanical action relative to their base, and mobile wheeled vehicles such as floor turtles and buggies. My favourite is the BBC Buggy from Economatics. I have found this extremely versatile device provides a useful starting point on the road to studies in control technology and artificial intelligence. Whereas floor turtles like the Valiant Turtle are concerned with Logo, turtle graphics and problem solving, the Buggy can teach a tremendous amount about computer control and the fundamental principles of robotics.

The Buggy's wealth of sensor perception is where it scores over other floor-crawling robots. It is equipped with collision bumpers, a light sensor and a bar code reader. To this may

be added a grab arm and a pen kit. There is an accompanying suite of 13 programs to help make the most of the robot.

It is the software which transforms the Buggy into a valuable educational tool. The programs aim to involve children in an interactive manner to demonstrate how a micro can be configured progressively as a switching device, a memory, a graphics terminal, a programmable device and a problem solving unit. They feature a 'building block' approach which enables and encourages older children to use the procedures in their own programs. There is real scope for exciting, experimental applications.

For young children the *Switch* program is ideal. It introduces how the Buggy's movement can be controlled and programmed in a really enjoyable way. *Memory Switch* extends these ideas and allows the Buggy to retrace its movements. Ideas of programming are further developed in *Snail*. The children prepare coded (Logo-like) instructions to drive the Buggy. Principles of artificial intelligence are demonstrated admirably in *Explore For Object*. Children really appreciate seeing the Buggy using its collision detectors to map out an object's shape on the screen. They are amazed that the Buggy exhibits 'intelligence'. The activity prompts much discussion and questioning. *Line Follower*, *Bar Code Route Planner*, *Sunseeker* and *Man v Buggy* are extremely valuable programs which are fun for children to use. They enjoy planning routes for the Buggy using masking tape and cards containing bar codes. The important point here is that they become aware of the application of these features in the real world. *Man v Buggy* never fails to fascinate.

To get the best out of the Buggy, it really pays to build a 'Buggy Park': a walled, working area for the Buggy to explore. Ideas for this are given in the manual. An area 150cm × 100cm surrounded by 4cm walls is ideal.

As an introduction to robotics and control the Buggy represents excellent value-for-money. It has so many capabilities: unlike other 'crawlers' it is far more difficult to exhaust its possibilities (see the review of the grab arm and pen kit in the June '85 issue).

Those teachers wishing to research the whole area of control and robotics will appreciate the help being given by specialist hardware companies such as Commotion, Innovonics and Pilot One. Each produces and/or markets kits and ready-assembled pieces of equipment which enable simple control and robotics to be undertaken at a reasonable price.

Taking Commotion first, this company has made a great name for itself with its Beasty interface – a device that allows the control of up to eight servo motors or relays from a BBC micro. This type of interface is important since it provides a buffer between the computer and the device being controlled, protecting the micro in the event of a problem with the device. The Beasty reinforces that protection since control is by infra-red transmission and there is no direct link between computer and device transmission. A cable version is also available.

This type of interface is specifically tailored to robotics applications but more general-purpose buffer boxes are available.

As well as supplying the Beasty, Commotion produces a robot arm kit and a whole catalogue full of bits and pieces needed to produce the robot of your dreams. The emphasis has been on cheapness without loss of quality.

Innovonics produces a very useful interface buffer board which is simple to use and designed for those who want to see the bare bones of what they are doing. It is a simple printed circuit board which may be purchased as a kit or ready made up (£10 or £11.50 respectively). It has a set of LEDs which light up according to the state of the user port to which they are connected and switching devices may be run from the board to enable the powering of motors and the like. Extensions to the board's facilities are likely in the future. If you want a cheap and cheerful start this is as good a place as any.



The BBC Buggy: 'provides a useful starting point'

Finally, Pilot One produces a complete course of hardware, software and documentation for the teaching of control. To give you a taster of the hardware, it includes Lego buggy kits, a variety of sensors, an electric loco, an alarm kit and an interface. The classroom kit which contains six interfaces and enough kit to keep a full class happy costs just under £1000. Both this company and Commotion make use of Lego and Fischertechnik construction kits. The larger Lego kit costs around £30, whereas the Fischertechnik Computing kit comes in at around £80. Both products are very robust and will take a good deal of pounding and provide a focus for projects of all sorts.

A book that is of a great deal of help to teachers in this area and should find a place on every school library shelf is *The Robot Book* by Richard Pawson. This colourful and well written summary of mankind's progress in robotics is readable and grabs the attention.

Robotics and control are exciting, develop skills of problem-solving and bring out the creative instinct in children of all ages. The companies featured here have gone some way to providing for your needs. They, as well as this magazine, welcome feedback.

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Inter-face box 26.85 + VAT
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'Make a Start' cards £2 + VAT

Meter
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BBC Buggy
Buggy £164.35 + VAT (software included)
Grab arm £79 + VAT (software included)
Pen kit £19.85+VAT (software included)

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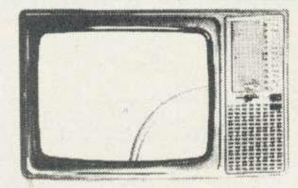
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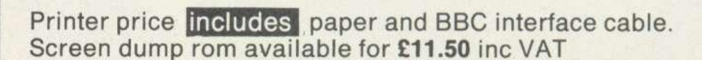
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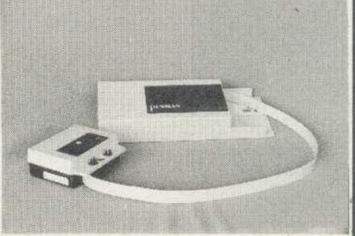
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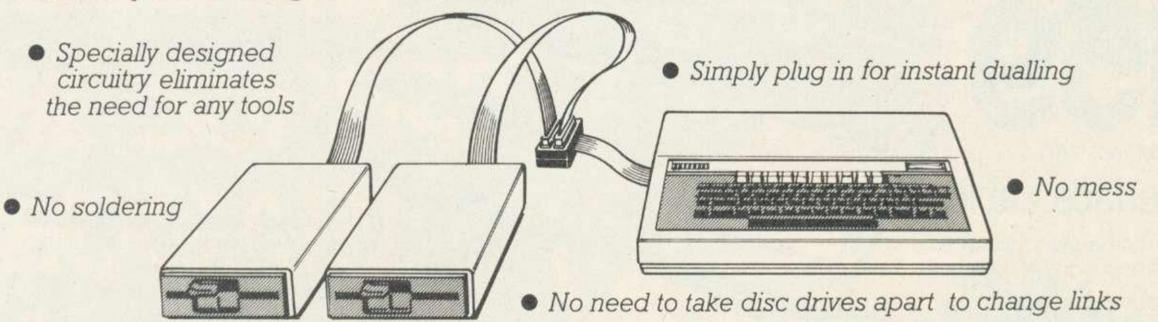


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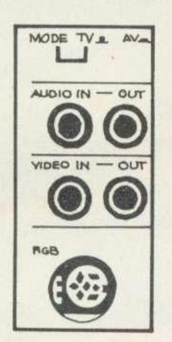
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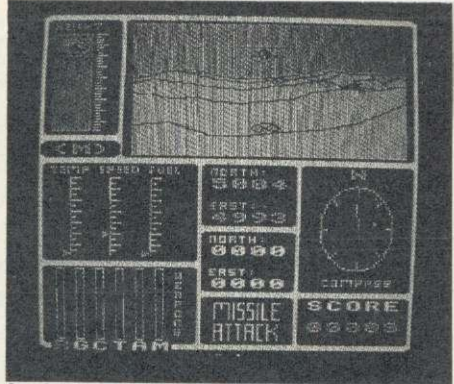
Checkout where your favourite game is this month

TOP 20 BBC MICRO GAMES

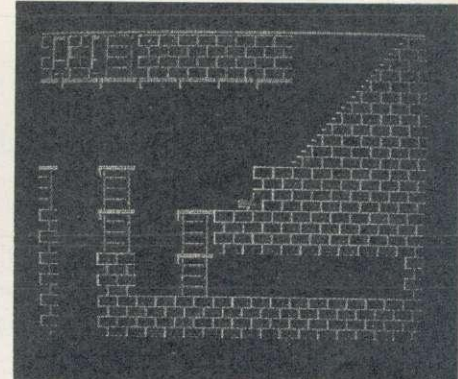
	Title	Publisher	Cassette	Disc	Reviewed
1	Match Day	Ocean	£9.95	–	
2	Beach-Head	Access/US Gold	£9.95	–	December '85
3	Revs	Acornsoft	£14.95	£17.95	July '85
4	Combat Lynx	Durrell	£8.95	–	September '85
5	Elite	Acornsoft	£14.95	£17.95	October '85
6	Knight Lore	Ultimate	£9.95	–	November '85
7	Alien 8	Ultimate	£9.95	–	
8	Repton	Superior	£9.95	£11.95	September '85
9	Atic Atac	Ultimate	£7.95	–	
10	Brian Jacks Superstar Challenge	Martech	£7.95	–	August '85
11	Scrabble	Leisure Genius	£12.95	£14.95	July '85
12	Red Moon	Level 9	£6.95	–	
13	Hobbit	Melbourne House	£14.95	£17.95	December '85
14	Jump Jet	Anirog	£9.95	£11.95	
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16	Wizadore	Imagine	£7.95	–	August '85
17	White Knight 2	BBC Soft	£9.95	£18.95	
18	Mr Freeze	Firebird	£1.99	–	
19	Boffin	Addictive	£9.95	–	November '85
20	Castle Quest	Micro Power	£12.95	£14.95	March '85



Beach-Head: no. 2 for the Beeb – tops on Electron



Combat Lynx: coming fourth in both charts



Castle Quest: losing its BBC micro power at no. 20?

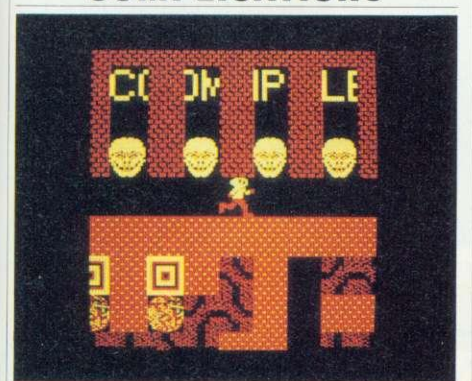
TOP 10 ELECTRON GAMES

	Title	Publisher	Cassette	Reviewed
1	Beach-Head	Access/US Gold	£8.95	December '85
2	Elite	Acornsoft	£12.95	October '84
3	Gremlins	Adventure	£7.95	
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5	Repton	Superior	£9.95	September '85
6	Bird Strike	Firebird	£1.99	June '85
7	Hacker	Firebird	£1.99	
8	Football Manager	Addictive	£8.95	March '85
9	Escape From Moonbase Alpha	Micro Power	£7.95	
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REVIEWS

SOFTWARE

MASSIVE COMPLICATIONS



'Repton 2', Superior Software, BBC B and Electron, £9.95 (cassette), £11.95 (disc – BBC micro only)

You know, you can get to hate software houses. I've never been that great at games; in fact, *Elite* still reckons that I'm 'harmless'. But things were improving: I'd just reached screen H on *Repton*, then those superior people drop this one on me – *Repton 2*.

The idea is much the same as before but a million times more complicated – no, make that 10 million times more complicated!

The object is to get rid of all the earth, collect all the diamonds, solve all the puzzles and avoid the monsters. So what? Might not sound too difficult but then I've still to tell you that there are (deep breath) 4804 lumps of earth, 1652 diamonds, 42 puzzles and 18 monsters.

All this is spread over 16 screens, though you're never quite sure which one you're on. You start off on screen 0 and to get on to the next screen you must transport yourself there by touching a transporter button – a sort of 'beam me up Scotty' effect.

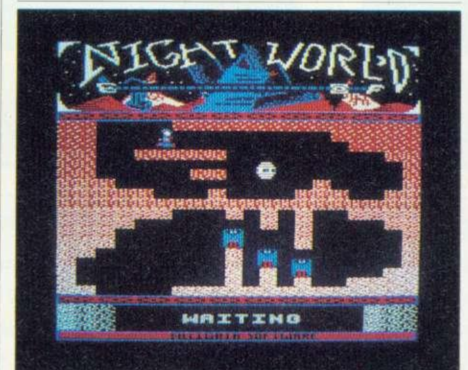
The aim of the game is to collect all 42 puzzle pieces and join them together at the bottom of screen 0 to form the final message. You can then take a photograph and enter the Superior Software competition.

I'm told the puzzles are very clever – they must be as I haven't solved one yet! I swear that they're impossible in some cases . . .

Luckily there's no time limit to the overall game, though some puzzles do invoke one. The graphics and mazes are better than before, and I'm most impressed with the way the sprites and maze scroll so smoothly. As with *Repton*, I'll stick my neck out and say that *Repton 2* is better than anything I've played on the BBC micro or Electron. Brilliant!

Bruce Smith

GOLDEN FLEECED?



'Nightworld', Alligata, BBC B and Electron, £7.95

I wonder if anyone has told the software houses that run-of-the-mill platform games have gone out of fashion. It seems not.

The scenario is the standard collection of platform-filled rooms, each of which appears to be very much like the last, perhaps because it is. The object is to find the Golden Fleece, another shining example of the game's complete lack of originality.

The graphics are nothing special. Clearly there hasn't been much thought put into the designs of the characters or scenery – with the exception of the demon at the top of the screen who is very impressive. Using a sort of slide-rule, this happy fellow displays your energy levels with a sly glint in his eye.

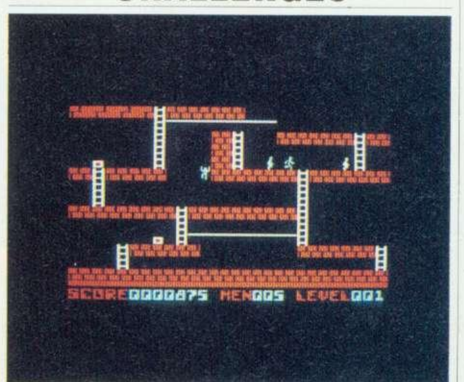
Another disappointment was the tune – in the absence of a sound on/off key I was forced to take drastic action and disconnect the micro's loudspeaker.

I have one final complaint about *Nightworld* which is that the walls very often do not behave as they should. Call me old-fashioned, but when I encounter a wall I like to be met with a reassuring thud.

If you're looking for a game for Christmas, *Nightworld* will disappoint you – try and find something better.

David Acton

LOADS OF CHALLENGES



'Lode Runner', Software Projects, BBC B, £9.95

At first sight, this game doesn't offer much for its above-average price tag. Your character ambles around platforms and ladders, but there are no moving escalators or conveyor belts to make his journey more exciting. There are no useful or belligerent things for him to pick up, only a few gold bars to collect. There are no damsels to rescue and only one sort of nasty to avoid. But don't stop reading here.

For once you get into it, this is a very challenging game indeed. The animation is smooth and fast, and for once our hero and his antagonists actually look and move like human beings instead of cartoon mutants. Moreover, the blue meanies interact with the hero in a semi-intelligent way.

Apart from moving left and right and climbing up and down, you can't do anything except drill holes in the brickwork with your laser – but this turns out to be a vital tactic, both to reach gold hidden in cellars and to dig traps for your adversaries.

Finally, there's no end of variety. The game comes complete with a staggering 160 screens and some are decidedly devious (number 16 is a humdinger!). What's more, you can build your own screens with a simple editing routine and save them for future use.

Lode Runner may appear to be just another variation on a well-worn theme, but in fact it's a superb example of the platform game, with no gimmicky extras; just fast and frustrating fun, with scope for infinite expansion.

Jeffery Pike

REVIEWS

SOFTWARE

STAR WARS REVISITED



'3D Space Ranger', Microbyte Software, BBC B, £4.95

I hope George Lucas isn't listening, because the scenario of this space-fight game is a rip-off of the first *Star Wars* movie. The mission is to penetrate the defences of the Death Star which is threatening Earth, fight off alien craft, zoom along a narrow trench and drop a photon charge in the exhaust ports leading to the main reactors. Sound familiar?

All this is explained at great length in the title pages, which also allow definition of which keys you want to steer the ship, fire the lasers, etc – although the game is slightly more fun if the joystick option is chosen. When the game is run the first thing that happens is nothing. Bits of space dust whizz past your ship, over which you have no control yet. After a while the ship's computer (the equivalent of R2-D2) tells you 'Aliens attacking', and a load of jam sandwiches hove into view.

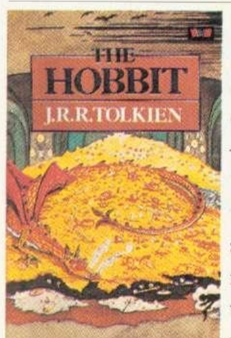
You can choose whether to shoot them (pretty easy) or avoid them (even easier). The trick, as with most alien-zapping games, is not to move around too much and don't shoot until you see the greens of their eyes. After a while, everything freezes again and you lose control while R2-D2 gives an 'Asteroid warning'. Then little plates of rice pudding start scudding past in all directions. There's not much option except try to avoid them, and this is easily achieved by hiding in the corner of the screen.

At last you're told to 'Stand by to descend', but there's nothing to do because a flat blue landscape suddenly appears and you just keep on flying and zapping. Then it's 'Entering trench', so you zoom along that for a bit, letting the computer keep the ship on course. When the target is reached, you don't even get the thrill of releasing your photon charges: old R2-D2 does it for you.

The mode 2 graphics are fairly clumsy and the 3D animation is positively crude compared to, say, *Elite*. Most irritating of all is the way the action keeps stopping between episodes. Value for money? You'd probably have a better time going to the cinema to see *Star Wars* again.

Jeffery Pike

A CHARM OF HOBBITS



'The Hobbit', Melbourne House, BBC B, £14.95 (book and cassette), £17.95 (disc – no book supplied)

The adventure-game world was taken by storm when *The Hobbit* made its appearance on the Spectrum some time ago. Although the graphics have been lost during its conversion to run on the Beeb, the novelty and charm of the game have been preserved.

The Hobbit is, of course, an adventure game based on the book by J R R Tolkien. You play the role of Bilbo, the hobbit, and your task is to recover the treasure from the evil dragon, Smaug. He lives far away on the other side of Middle Earth, the enchanted land which is your home.

Because *The Hobbit* is based on a novel, the characters and plot are of a much higher standard than in most adventure games. No one character is fixed to any one location – all move around the land intelligently.

The computer understands a large vocabulary and complex instructions can be issued to the other characters. Even a few adverbs can be thrown in – a welcome change from the typical 'take sword' type of adventure.

A slightly annoying feature of the game is the necessity to load some data from tape whenever you restart the game.

This is a trivial point, however, and is heavily outweighed by those on the positive side. Adventure addicts will adore *The Hobbit*, but even those who, like myself, are very choosy when it comes to adventures, will enjoy it thoroughly. And, of course, if you tire of the game you can always read the book – supplied with the cassette.

David Acton

HERSHEY BARS UNDER NAVARONE



'Beach-Head', US Gold, BBC B and Electron, £9.95

This is a program in the John Wayne tradition. The objective is to disable the enemy, make a landing on their beach head, and then plough inland and assault the fortress of Kuhn Lin.

The first screen shows an aerial view of the coastline under attack. You move a crosshair cursor to select the route you're going to take. A head-on assault will find the enemy forces at full strength, while a trip through the 'secret passage' will catch them off-guard.

Once through the passage, you engage the enemy navy, who launch waves of fighter-bombers – so pot them off with your Ack-Ack guns before they destroy your fleet. Where is your own air support? All below deck chewing Hershey bars, for all I know!

After the aircraft have dropped their loads, the ships start on you. Now bring out your guns and try to get the elevation right to drop one on each of three ships. The aircraft carrier which did the damage in the previous screen tries to slip away unnoticed – extra points for sinking this.

If you destroy the enemy fleet before they obliterate your forces, you can land tanks to make an assault on the fortress.

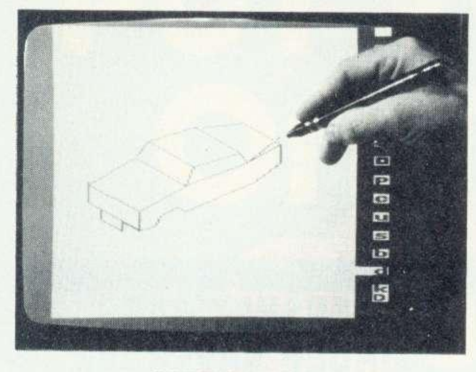
After dodging the enemy land forces to get into a good position for bombarding the castle, you'll need to make it through with several tanks at least.

The final assault means hitting targets on the fortress before their Navarone-style gun lines up on you.

This game was one of the big successes on the C64 and Spectrum, but I didn't find the action or the graphics particularly impressive. Will I buy it? You have got to be joking.

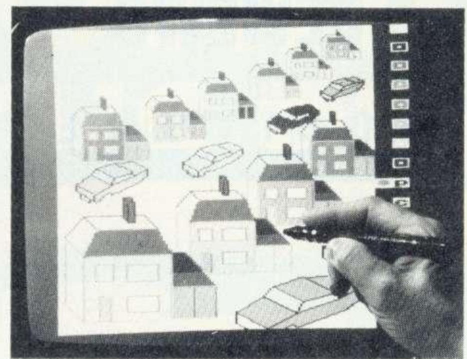
Simon Williams

THE AMAZING LIGHT PEN DESIGN PROGRAM



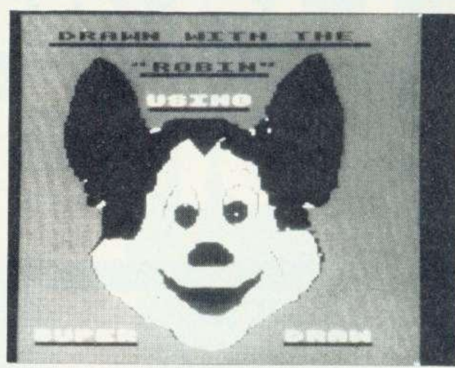
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COST £11.50 inc (Introductory offer £9.95).

INTRODUCTORY OFFER Robin Design PRICE £11.50 inc. (on disc £15)
This program only works for switch activated light pens such as Robin, Datapen and RH. Please state make of pen when ordering.

REVIEWERS COMMENTS
"OUTSTANDING" D. Futcher of Educational Computing.
"RECOMMENDED AS the PEN FOR PRIMARY SCHOOLS" M. Jackson of Primary Teaching and Micros.
"I RECOMMEND the ROBIN. After all it's the one I use" Ron Owen author of PENPAL.

GENERAL LIGHTPEN PROGRAMS These programs work with most light pens excluding the RH
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PAINTBRUSH – the FAMOUS painting and plotting program described in Educational Computing as "AMAZING and FANTASTIC" £11.50 inc.

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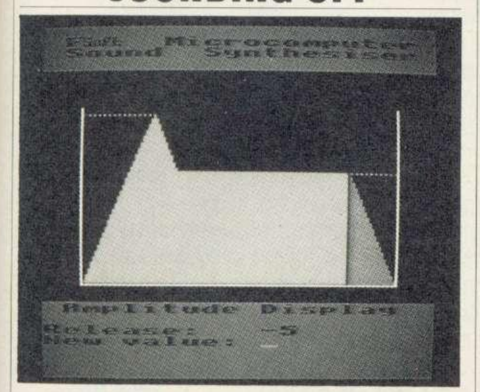
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SOFTWARE

CLEVER SOUNDING OFF



'Music Maker', FSoft, BBC B, £9 (cassette), £12 (disc)

This is not one but two sophisticated programs in one package. It's not possible to jump back and forth between the two, so you need to make the most of the first, 'The Sound', and to save the data you generate with it, before moving on to the second, 'The Player'.

'The Sound' is an attractive envelope generator program. It supplies 16 preset envelope shapes and allows you to fiddle around with them or invent new ones. You fiddle using the function keys (a clear, detailed key strip is provided), the cursor keys and Copy. As you change various parameters, the new values are displayed numerically and an excellent four-colour graph shows just what's happening to your envelope shape. (For clarity, there are two graphs, one for the pitch parameters, another for amplitude.)

For anyone still struggling to understand exactly what the Beeb's 14 envelope parameters actually *do*, this program gives as clear an idea as anything I've seen, for not only are the envelope shapes displayed graphically, you can play the note you've created using your Beeb as a sort of synthesiser keyboard: white notes on the keys from Caps Lock to Return, black notes between Tab and £. It's polyphonic, too, using all three tone generators to enable you to play chords and another row of keys (Z to ,) for noises from channel 0.

The menu allows you to store your new envelope in any one of the remaining 15 locations, to summon up one of the others, to save envelopes you've created on tape or disc, to load new ones, and finally to jump to the second program, 'The Player'. But don't jump until you're ready. It's impossible to get back into 'The Sound' without reloading from the beginning – which is particularly tedious when using cassette.

Once you've set yourself up with 16 delightful envelopes (and yours couldn't be any worse than the 16 supplied with the software), you're ready to make music with them. 'The Player' retains the synthesiser keyboard effect, but this time as you play notes, they appear displayed on two musical staves (treble and bass clefs), romping across the screen from right to left. The speed at which they travel is adjustable, and you can play with or without a metronome ticking out the tempo.

You can still play polyphonic chords and choose between the 16 envelopes you have on board. In fact, you can use two at the same time by 'splitting' the keyboard at the note of your choice – for example, anything you play above middle C is envelope 12. The bottom row of keys still operate channel 0, so various percussive effects can be thrown in for good measure.

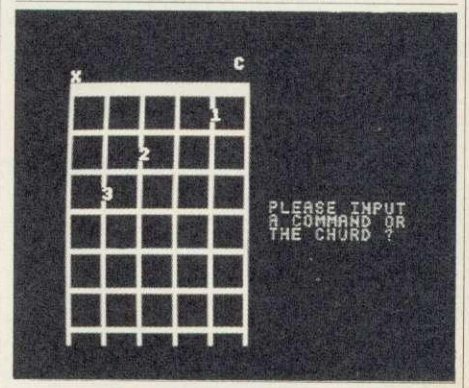
It's not easy to play satisfactory music 'live' (qwerty keyboards weren't designed for that), but it's only a short step from playing music to 'recording' it with the Sequencer. This allows you to store tunes of considerable length (up to 1024 beats of the metronome), one channel at a time, then to record another 'track' as the first one plays back, then another on top of that – plus a percussion track on channel 0 if you wish. If you make a mistake, individual notes on individual channels can be deleted, inserted, or altered for pitch or duration. Finally, when you've created a 1024-beat, four-voice masterpiece, you can save the whole sequence on tape or disc.

If that sounds like a lot of complicated operations, it is. But writing polyphonic music is a complicated operation however you do it and the Beeb's sound facilities wouldn't be so interesting if they weren't so complex. Of all the current software designed to 'record' three- or four-channel music on the BBC micro, this program is perhaps aimed particularly at the musician. Not only do you enter your notes by 'playing' the keyboard, rather than digitally, you also see something like the written melody on the screen, which helps if you're familiar with written music.

Congratulations to the author, Geraint Wiggins, for two clever and practical programs, a clear and informative instruction booklet – and a quite brilliant example piece for the Sequencer, to demonstrate just what is possible.

Jeffery Pike

TEACHING COULD BE BETTER



'Guitar Chord Tutor', P R Adby Associates Ltd, BBC A/B and Electron, £14.95 cassette only, transferable to disc

A rather neat idea, this, but not executed as well as it might have been. The program draws a guitar fingerboard (the first six frets anyway) and invites you to enter a chord, using letters A to G and the function keys to represent the conventional chord symbols – C7, A flat m6, etc. It then displays the finger positions for your chosen chord on the fretboard and plays it as an arpeggio.

Full use isn't made of the Beeb's three sound channels: the notes ping out in sequence, without a bit of overlap which would give a better impression of a chord being played. Worse still, they actually sound an octave higher than they should on the guitar (perhaps Kevin Rogers, who wrote the program, forgot that guitar music is written an octave higher than it sounds). This elementary blunder is repeated when tuning your guitar. It's easy to summon up your E, B, G, etc – but they all come out an octave higher than the true pitch of the guitar's open strings.

Finally, there are a variety of pre-programmed chord progressions available (the booklet claims 98 but it must mean 96). You choose your starting chord (which must be a major), decide how many chords you want in the sequence, from two to five, and your micro does the rest: the chords are displayed on the fingerboard and played (an octave too high, needless to say) through your speaker.

The instruction booklet, by Paul Adby, is clear and accurate; the graphics, such as they are, are rudimentary but quite adequate; only the sound lets it down – which is rather a pity in a program which is all about making sound!

Jeffery Pike

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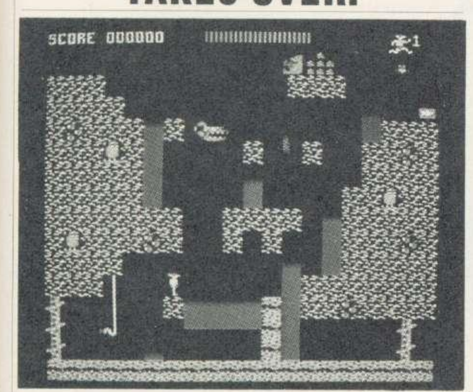
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SOFTWARE

TARZAN TAKES OVER!



'A Fist Full of Fun', Alligata, BBC B, £9.95 (cassette), £13.95 (disc)

This is a five-game package with three oldies: *Bugblaster*, *Uncle Claude* and *Tarzan*; bundled with two new titles: *3D Space Raiders* and *Growing Pains* – all on one tape, and at the bargain price of £9.95 for the lot.

How do you review a package such as this? Five games like these for a tenner has got to be good value, and any self-respecting alien-zapping Beeb owner would love to see more cut-price combinations following in the footsteps of this multi-game package.

Considering the price of each game (at £2 each, even less than Firebird!), any comments that I might make about slight shortfalls in playability/graphics/sound, and so on, just don't seem relevant, since the two-quid game is a whole new yardstick to measure game value against.

The three oldies should already be known to a lot of readers (*Bugblaster* was reviewed in *Acorn User* October '84) and the two new games are certainly not trailblazers. But they're better than many.

Dealing with them as they're presented on the cassette, the first is *3D Space Raiders*. It's the old Atari *Star Raiders* theme, with 15 keys giving access to a galactic map, a front 'cockpit' view with stars shooting past, rear view, hyperspace, shields, fuel, etc – all the functions you'd expect.

Find the aliens on the Galactic map, and go into battle – *Elite* it certainly isn't, but it's very good value.

After blasting your way through space, it's back to earth with a thump, finding yourself in the jungle with *Tarzan* (pictured above). It's a bright, colourful scene, with snakes, cheetahs, monkeys, alligatas and, of course, Jane. There are four screens of jungle to run and jump through – a couple with rivers, others with moving lifts; and you've got to follow the arrows to get to Jane. Four screens isn't really a limitation, as the difficulty of the game means it's likely to be a while before you can complete them all.

Growing Pains comes next, with you taking the role of a gardener who has to wander around the maze-like screen, watering plants, avoiding snails and spraying the bees with insect spray. If you get stung in this game, you don't die immediately, but you have to rush to the garden shed for first-aid before you die of a heart attack. Graphics and sound aren't brilliant; however, I'm just going to have one last attempt at clearing the first screen . . .

Uncle Claude is the best game on the tape – it may be a bit old, the graphics a bit shaky, and the sound a bit weak, but it's *very* addictive, great fun, and it's got that hint of originality which is the secret ingredient of all the best micro games.

You (Micro Mickey!) have got to push various items (such as computers, cassettes, monitors, etc) that are scattered around and load them onto the constantly moving conveyor belt at the bottom of the screen. The twist is that you're constantly harrassed in your attempts by Uncle Claude (who may be better known to you as Uncle Clive – red beard, high forehead, glasses, etc) and not only is he chasing you, but he's chucking Spectrums (or QLs?) at you.

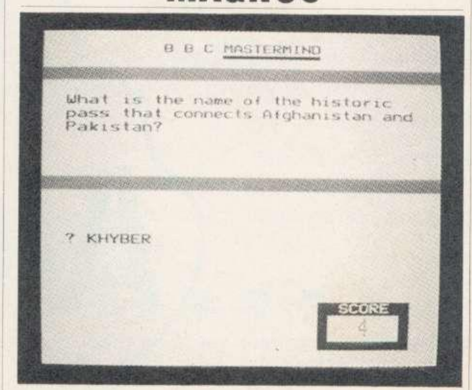
There are also the odd Orics and Electrons flying around. Uncle Claude can be floored by hitting him on the head with whatever you happen to be pushing, but if you miss, or if you get hit by any of the flying hardware, then you drop to the bottom of the screen to be carried away by an ambulance. Great stuff!

The final game is the oldest and most familiar – *Bugblaster* – an adequate version of the arcade classic, *Centipede*. Fast, colourful graphics of spiders, snails and caterpillars, all having to be shot down as they bounce, drop or slither towards you through a field of mushrooms. If you don't already have a version, this one's a must.

Conclusions? If you haven't got any of the games on this tape, then buy it! Even if you've already got a couple, it's still worth having, considering it's only going to set you back a tenner. Who knows, if it's a success, you may be encouraging other software houses to follow suit.

David Keel

MASTERFUL MAGNUS



'BBC Mastermind', Mirrorsoft/Ivan Berg Software, BBC B, £9.95 (cassette)

This is a simulation of the BBC TV programme of the same name chaired by Magnus Magnusson. The computer is the quizmaster and you, with up to three others, are the contender competing for the Mastermind title.

Once the main program has loaded the computer asks how many people are going to take part.

It then requests the name and occupation of the first contender before asking what specialist subject he or she wants – the choice is films and TV or sport and games.

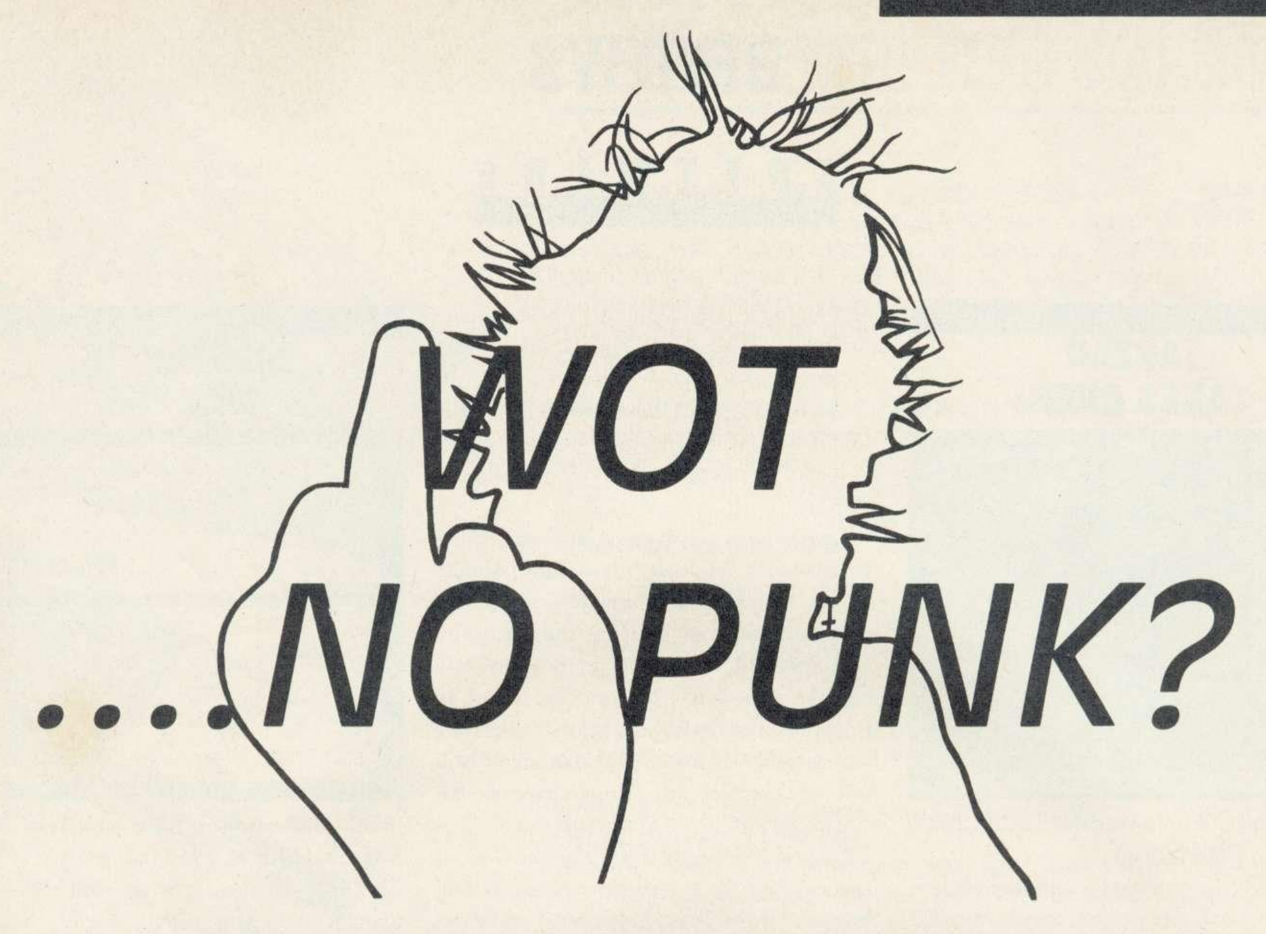
The first contender has two minutes in which to answer questions on this specialist subject. When one participant finishes his/her questions the next must enter name, occupation and specialist subject. If the subject chosen is the same as that of the previous contender then the questions do not have to be reloaded (nor are they repeated), so it's better to sort out who wants which specialised subject before you begin.

When everyone has finished this section, general knowledge follows. There is a choice of sets of questions, but only one can be used in each round.

A problem is that, because of pauses, it's too slow at times – such as when all the rounds have been completed – and too quick when the 'passed' questions are displayed together with the answers.

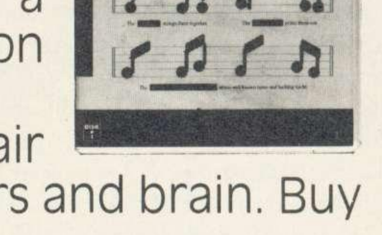
Overall, if the few drawbacks were ironed out, the program would be even more addictive and offer greater value for money. Anyone who wants to learn something and enjoy themselves at the same time could do a lot worse than buy it.

Steven Howe



The Music System is now available for everyone ..... toddlers to grannies ..... bathroom virtuosos to budding Beethovens.

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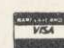
It features unparalleled facilities for creating, editing, playing and printing tunes whilst still being simplicity itself to use.

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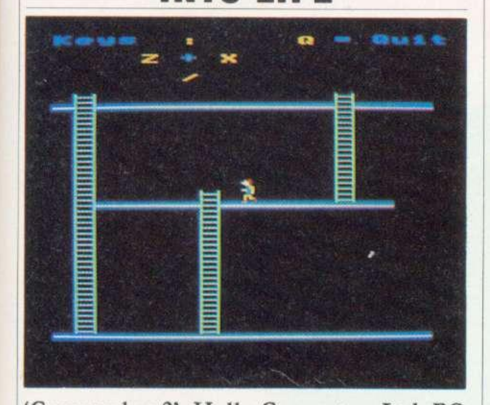
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SOFTWARE

SPRITES SPRING INTO LIFE



'Gamemaker 2', Holly Computers Ltd, PO Box 17, Bingley, West Yorkshire BD16 3JQ

Gamemaker 2 is unusual in having been written especially for the Electron, and should therefore have taken account of the slower clock rate to keep the final speed up.

This package is something of a departure from other sprite programs in being entirely menu-driven, a good thing as it makes the program easy to use.

The only problem with the package is the limited memory available, which necessitated the use of sub-menus in more than one of the sections of the program. This means occasionally that options are displayed that are not actually available – though it's something you soon get used to, however.

Apart from the sprite designer and your own games programs themselves, all work is carried out in mode 4, which makes for easy reading. Six options are available from the main menu:

Image maker,
Sprite viewer,
Input tape-file,
Output tape-file,
Game-user 2 and
Prompts (on).

Image maker handles the definition of images and not that of sprites, an important distinction, as two different images may be assigned to a single sprite, allowing simple animation. Up to 48 images may be created, of the standard 8 × 8 pixel size. A maximum image size of 16 × 24 is also possible, but with fewer images available.

This makes the system very flexible and it will cope with most of the sprite shapes you might want to design.

The Sprite view allows you to assign your defined images to a total of 32 sprites (less if they are large). An interesting facility within this section of the program is the ability to view both images assigned to any sprite and alternate between them via the keyboard, thus stimulating the animation you will be able to provide in your own program.

Files of sprites may be stored on tape and recalled later for use by the second program within the package, by selecting the appropriate options from the menu.

The prompts provided on-screen may be turned off once you become totally familiar with the system.

The second part of the package is User2. This is the machine code control program which gives life to the sprites you created with Maker2 and resides at &1B00, leaving only about 6k for your program.

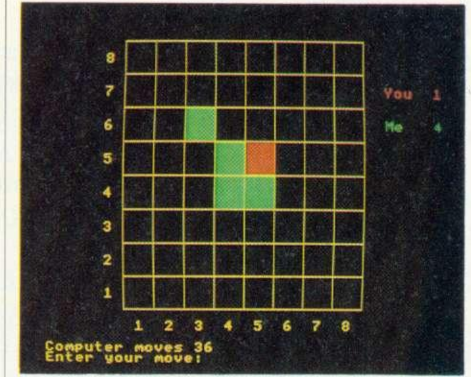
However, a lot of facilities are provided by the package, so that collision detection, and so on, will require very little extra Basic. All the sprite control commands take the general form *GMts (,). The first lower-case character gives the type of command, the second the number of the sprite to which it refers and the optional comma indicates that further parameters will follow. It's a very economical and easy to use format.

The *Gamemaker 2* manual is well written and comprehensive and, all in all, the package is highly recommended.

As far as I can see, it works perfectly on the model B as well!

Simon Williams

CREATE YOUR OWN GAMES



'Game Core', BBC Soft, BBC B, £10.95.

Game Core is not a program that is easy to review in a short period of time. With a utility intended for arcade games, like a sprite utility package, it is possible to set up characters and test out the movement routines without having to go into the intricacies of programming a full game.

Not so with this program, which provides the 'tree searching' routines incorporated in most strategy and board games.

Everything from noughts and crosses to chess falls into the general category of game that can be programmed with *Game Core*. The governing rules are listed in the 36 page manual as follows:

there are exactly two opposing players;
the players play alternately (or pass);
the number of possible moves in any position is finite;
there is no randomness (such as the roll of a die);
both players have full information about the game.

In the same way as with sprite utilities, however, there is a large part of the programming work that till needs to be done by the programmer.

So much so that, when asked, BBC Publications said there were no restrictions on the commercial sale of games using the core, only that they would be grateful for an acknowledgement.

The *Game Core* package consists of one complete example game, *Reversi,* two others supplied as a set of procedures which can be easily combined with the machine code core routines (*3D OXO* and *Pentagon*) and a tutorial example, *Don't Be Greedy*.

All the games play well, but none are visually exciting – but of course that is one of the areas left to the programmer. Also included are a simple character generator, a boot file for conversion of the programs to disc (why can't more software houses folloe the BBC's lead?) and source and object listings of the core routines themselves.

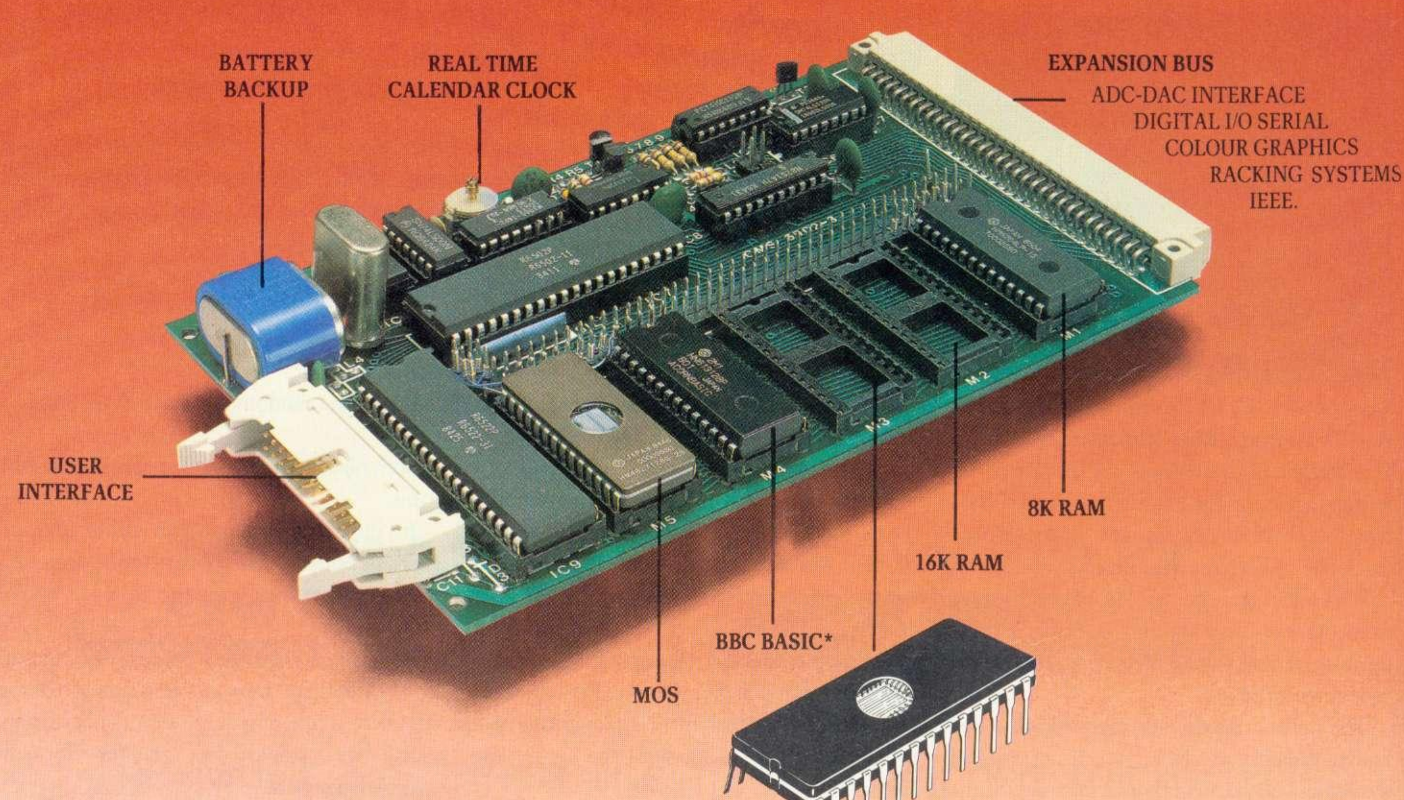
The manual is very comprehensive and attempts to be a textbook on strategy game creation as well as detailing the use of the tape. However, anyone intending to make full use of *Game Core* who is not already experienced in this kind of work would need one of the several game books on the market in addition to this manual.

If you're prepared to put a lot of effort into programming a game of strategy, *Game Core* will enable you to create the guts of it much more quickly. A very valuable utility.

Simon Williams

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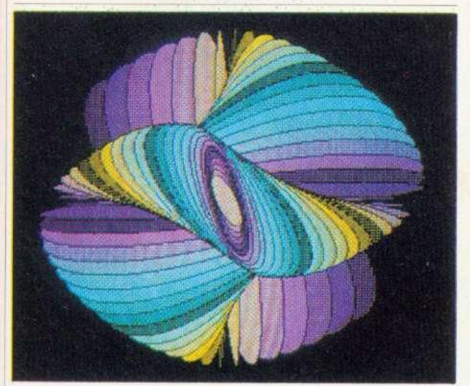
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FIRMWARE

GREAT FOR GRAPHICS



Graphics Extension ROM Acornsoft, £29.95.

Acornsoft's long-awaited Graphics Extension ROM has now been released and those who have been waiting are not likely to be disappointed. It is effectively a 16k extension to the operating system of the BBC micro and the facilities offered fall into two categories. First, and probably of most interest to serious graphics programmers, it offers enhanced shape plotting, flood-fillings and the ability to move or copy part of the screen. Second, there is a substantial sprite package with which, it is claimed, arcade-style games can be programmed in Basic.

Apart from a few * commands, the ROM makes use of many of the previously unassigned PLOT codes, VDU codes and GCOL statements. These have the advantage over the * commands generally used to access sideways ROMs in that parameters can be passed to them from Basic in the form of numbers, variables, expressions or functions. Access to the ROM is also possible from any other language which supports graphics and from Assembler via the OSWRCH vector. The manual states that the ROM is compatible with all current Acorn second processors.

I was struck by the speed at which it operates. If you've seen an Acorn Bitstik drawing system in operation you'll have some idea of the speed shown in the flood-fill , circle, arc and other shape plotting operations. This ROM has the advantage over Bitstik that it will work in any of the graphics modes.

The ROM is, by default, inactive until called with the command, *GXR. This command also reserves the three pages of memory that it normally requires for workspace. In other words, if you have a standard BBC micro with an Acorn disc filing system, you'll find that PAGE is reset to & 1C00. Flood-filling uses two of these pages and, if this facility is not required, they can be reclaimed with the command *NOFLOOD. *FLOOD restores it.

The general method of using the new shape plotting commands involves MOVEing to either one or two key locations followed by a PLOT, with the appropriate code, to a further location. To draw a circle, you MOVE to the centre and then PLOT a point on the circumference.

Ellipses are defined by three locations: the centre point, the outermost point (left or right) at the same height as the centre, and the highest or lowest point of the ellipse. This allows ellipses to be drawn at any angle.

Any of the filled shapes can be drawn either with the normal solid colours available in the current graphics mode or with a predefined pattern of pixels. New colours can be generated by 'dithering' combinations of different coloured pixels; for example red and magenta give a deep pink.

There are four pixel patterns immediately available at any time, selected by GCOL16, GCOL32, GCOL48, GCOL64. If the second parameter in the GCOL statement is between 0 a 127 it defines a foreground pattern; 128 to 255 defines a background. As well as four patterns available by default, new pixel patterns can be defined using VDU23,<2-5> followed by eight bytes. The eight bytes required to produce a particular pattern in a given graphics mode theoretically requires a knowledge of the way in which the colours are stored in that mode. This is explained in some detail in the manual but the task is greatly simplified by a pattern editor program supplied on the cassette. Lines can also be drawn using these colour patterns, the exact effect being dependent upon the angle of the line. The same patterns can be used by the flood-fill commands to fill any enclosed outline shape.

PLOT codes &10 to &1F and &30 to &3F expand upon the simple dotted lines offered by the standard operating system by drawing lines in a predefined dot-dash pattern. VDU23,6 followed by eight bytes sets up a dot-dash pattern and the particular PLOT code used defines how the line will be drawn – whether the first and last points are drawn or omitted and whether the pattern is continued or restarted at the beginning of a new line.

The move and copy facility allows a rectangular region of the screen, defined by two MOVEs, to be either moved or copied to elsewhere on the screen. Again the speed is impressive and will be much appreciated by anyone who has used conventional routines to redraw part of the screen pixel by pixel. In fact the speed is sufficient to allow these commands to be used as a form of animation; a large area of screen can be repeatedly repositioned quickly and smoothly.

The manual supplied was only a provisional version but shows evidence of the normal high standard of documentation associated with Acornsoft products. Each type of command is carefully explained and examples of its use are given. A cassette containing program examples and demonstrations accompanies the package. It also has a drawing program which makes good use of the new commands.

Sprites, when required, make a further demand on memory to store their definitions. *SSPACE n reserves n pages of sprite memory. *SEDIT N then calls the sprite editor so that sprite number N can be designed or, if it already exists, modified. The editor's facilities are fairly extensive, including horizontal and vertical mirroring and the ability to flood a row or column with colour.

An interesting alternative way of creating sprites allows any rectangular area of screen to be captured and henceforth used as a sprite. Examples of the many ways of using sprites for animation are included in the manual and on the cassette.

Altogether this is one of the more impressive of the many sideways ROMs currently available. Inevitably there are facilities not included that some people would find desirable. For my own part, I would be prepared to sacrifice the sprites for general scaling and rotation commands. Nevertheless it does vastly increase the graphics potential of the BBC micro. Apart from offering speed that would be difficult to match and despite its workspace requirements, it should free more programming memory in the higher resolution graphics modes on a standard machine, since procedures for primitive functions such as circles and filling will no longer be required.

The manual received does not mention whether the ROM is compatible with the shadow screen memory of the B+, although it does imply that it will work with an Aries B20 board.

If you're into graphics and can find room for one more ROM, this has got to be the one.

Malcolm Banthorpe


Leonardo Da Vinci, Isambard Kingdom Brunel, Guglielmo Marconi, Albert Einstein, Jack Kilbey, Touch Pad...and your imagination.
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THREE FOR THE BUSINESS USER



'DDD Base', 'DDD Calc', 'DDD Plot', £29.95 each or £69.95 for the suite, Gemini Marketing, Gemini House, Concorde Road, Exmouth, Devon EX8 4RS. Tel: (0395) 265165

The main difference between the average business computer and the BBC micro is, of course, the Beeb's small memory space. You would expect an integrated package for the Beeb to run out of space, so how do Gemini's programs manage?

All the modules of the suite make extensive use of disc filing, with the advantage that the size of the application is then governed by the capacity of the discs, and not by the size of the micro's memory. Against this, frequent disc accesses slow the programs down, compared with similar programs working entirely in memory. The DDD programs can make use of up to two disc surfaces, or a maximum of 400k (800k double-density).

Rather than designing the suite as a set of memory overlays on one set of data, Gemini has chosen to make the disc files completely compatible, so the same file can be transferred from one application to another, simply by loading the new application and reloading the file. Although a little more cumbersome, it allows you to run each program independently, so you're not obliged to buy the suite.

DDD Base

DDD Base is a simplified version of *DataGem,* both in the facilities it offers and in its ease of use. When you load the program you are shown a short mode 7 menu of the initial options (all three programs work primarily in mode 7), including Escape which presents you with a blank 'card' for you to format as needed.

You can enter fields at any point on the card you like, by positioning the cursor and pressing CTRL-F. You then select a number of formatting options and the field is locked in position. Headings are even easier to enter; simply position the cursor and type. The format of the card can be modified at any stage, but new fields can't be added once data has been entered into it.

To help with the entry of data, *DDD Base* provides 10 user variables which may be assigned formulae and used as the contents of fields. In addition, there are five system variables, which govern things such as the file title and the setting of the interrupt-driven clock, which is a feature of *Base* and *Calc.*

Like Gemini's *DataGem* (a chip-based database), *DDD Base* makes use of a 'browse' mode which allows you to call up records, edit, search or sort them, and add fresh ones. Browsing is noticably slower than with *DataGem,* because each record is loaded in turn from the disc.

To edit a record, you move the cursor to the required field and overtype or edit the entry. The record scrolls left and right through its maximum 79 columns and the cursor moves up and down to cover its 26 rows.

In addition to the normal search facility, which offers a number of different search criteria, *DDD Base* has a 'key' search, which will match an entry in a key field in about five seconds. Sorting can also be based on a key field, and both keys may be changed from within the program. The result of the normal search will be put in a subset, which can be accessed independently of the main file.

You can only print out records as they stand. There's no facility to set up a secondary print format, or to print file statistics.

DDD Calc

This spreadsheet can handle an extremely large sheet. Up to 52,000 cells may be defined, and because the sheet is disc rather than memory-based, all may be filled at once. It takes a long time to move from one section to another.

The *DDD Calc* sheet is divided into 'pages', with a maximum size of 26 columns by 20 rows, and to move from one to another takes about 25 seconds. This will appear very slow if you've used a memory-based sheet, which allows you to scroll at will through RAM. To speed things up, Gemini uses an intelligent load and save algorithm, which will only transfer rows of cells containing alterations. It also advises careful thought on the positioning of different values, to ensure the minimum number of page swaps during recalculation.

As with *DDD Base,* entry of data into the cells is very straightforward. There are three different types of entry. A straight number will be entered as it stands, any string preceded by '"' will be entered as text, and anything else is taken as a formula. A formula may contain a Basic mathematical function, and sum, maximum, minimum and average. Ten user variables are again available and may be used on their own in cells, or combined with other cells or variables in formulae.

Column widths may be set up individually and strings may overrun more than one column if the succeeding columns are blank. Each cell can be formatted independently and locked to prevent accidental overwriting. All the normal features of spreadsheets are provided, including replication of cells into blocks.

Instruction to the program can either be by Escape or CTRL sequence, using the same command letters in either case. Thus Escape will bring down a menu over the sheet and you can select a function from this, or you can call the same function directly by typing CTRL and the command letter.

DDD Plot

DDD Plot provides business graphics, using data from either of the other two programs. The graphics are produced in mode 1 in four colours, and may be histograms, pie charts, line or scatter graphs.

You can select the type of graph and manipulate the axes, legends and scales in a number of ways, or accept the default settings.

A particularly nice feature of the program is a graphic screen editor which allows you to type notes on top of the graphs and charts, in two sizes of text (see screenshot above).

The completed graph can be printed out, either by using the built-in Epson screen dump, or by inserting your own call to a screen-dump ROM or disc-based routine. Completed graphs can also be saved to disc and loaded again independently of *DDD Plot.*

Conclusion

In conclusion, each module is designed to use the others' data files with little difficulty and to bring its own 'expertise' to bear. It's a shame, though, that data still has to be spooled out to be used in a wordprocessor.

Each package can handle a very large data set and, although the speed (particularly of the spreadsheet) is slow compared with more conventional products, the trio of programs is sound and is very good value for money.

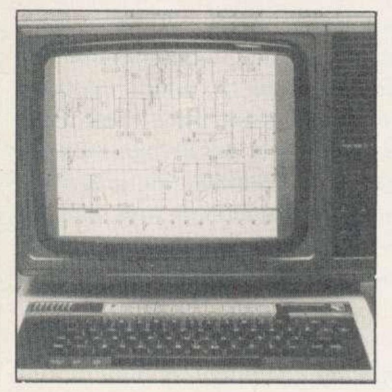
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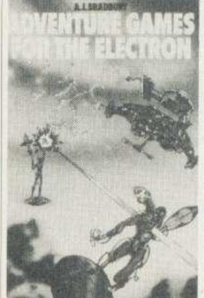
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BOOKS

THE BEGINNING OF AN ADVENTURE



'Adventure Games for the Electron', A J Bradbury, Granada, £6.95

The Electron is designed as a high-resolution graphics micro, not for text display, and so adventure games are not the first thing one would think of for the 'baby brother'. But adventures have been written for 8k and 16k machines, so why not for the 32k Elk using its 8k mode 6?

Electron owners are just as likely to graduate to adventures as owners of QLs or IBMs. So it has come about.

This is a highly readable introduction to the art of amateur adventure creation. Like most other books in the category, it restricts itself to Basic, though the general principles mapped out here do in fact pass over into machine code if you are really aiming high.

All the main issues involved in the adventure trade are given a pretty thorough airing, as one might expect from an author who is both a computer studies teacher and an adventure addict. In some ways the book is more suitable for someone who knows a bit about the adventure world and can appreciate Mr Bradbury's subtle insights.

He suggests that the sophisticated parsers of *The Hobbit* and *Zork* may be unnecessarily complicating and actually hamper the adventure game – a heresy with more than an atom of truth in it.

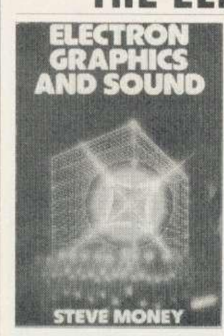
Nevertheless you will have to be a very persistent reader and programmer to write an adventure with the help of this book. If you have already started, got some way, and perhaps got stuck on some point, you might find the answer here.

Unlike some other guides, this one does have a complete short mini-adventure listing in an appendix. The points made in the preceding chapters do not refer to this listing but give examples of procedures that could be used to do certain jobs in any game.

Text compression, so vital for the Electron, is dealt with thoroughly and helpfully, with program listings included.

I have been enjoying adventure games for nearly as long as Mr Bradbury, but he managed to give me plenty to think about, particularly on 'brainstorming'. This is a worthwhile book for the serious game-creator, and a good read for those who are very experienced or just mildly interested. **Peter Voke**

SEE AND HEAR WHAT THE ELK CAN DO



'Electron Graphics and Sound', Steve Money, Granada Publishing, 188 pages, £6.95

Anyone starting to tire of playing ready-made games on a newly-acquired home computer and wondering how to answer the inevitable enquiries of 'Yes, but what else can you actually do with it?', is likely to find that graphics and sound are among the most attractive areas for initial attempts at writing programs. This book, while not specifically setting out to teach general programming techniques, could provide a starting point for Electron owners who have little other programming experience, as well as being a source of reference for more established programmers who want to find out more about the areas of graphics and sound.

As far as the graphics aspect is concerned, the book starts from scratch by explaining their potential use and how the video display is produced. Line and point plotting, colour, character graphics, graphs and charts, animation and elementary three-dimensional plotting are covered in subsequent chapters.

Simple trigonometrical theory is introduced where it's necessary.

The first of two chapters devoted to sound covers the SOUND and ENVELOPE commands and demonstrates how they may be used to generate sound effects. The second contains some elementary music theory and shows how the Electron can be programmed to generate tunes and chords, and be turned into a simple keyboard instrument.

There are plenty of program listings throughout to demonstrate the points made in the text. They are clearly laid out and amply commented on so that they may not only by typed in and run but also understood by the inexperienced programmer.

I was glad to see that the programs in this book, on the whole, make good use of BBC Basic in that, although some use GOSUBs, procedures and local variables are introduced in the second chapter.

As a minor grumble, it was disappointing to find that a sketching program in the first chapter is terminated by jumping prematurely out of a FOR. . . . NEXT loop. The technique will work in this particular case, but is definitely not to be recommended.

In general, the book succeeds as a useful introduction to its subjects while demanding no great degree of previous programming experience. **Malcolm Banthorpe**

A POCKETFUL OF ELECTRON HELP



'Electron Micro Guide', Peter Morse and Brian Hancock, Century, £1.99

When I bought my first computer, I spent a lot of time looking through the user guide trying to find programming commands that I knew were mentioned there. After several very frustrating searches, I resolved to make my own notes for those parts of the manual that I needed most.

It appears that Professor Peter Morse and Brian Hancock have found the same problem, but their solution goes one stage further as they've written this short book. A small hardbound pocket-sized reference guide for the Electron user, it is good value at £1.99. The 40 pages contain a summary of the essential information needed – covering the Basic commands, sound, graphics, colour, input/output instructions, numeric string and trigonometric functions, logical operators, error handling codes and messages, operating system commands and *FX calls.

The book contains no information that cannot be found in the full user guide, but the information is easy to find, it's carefully laid out and the print quality is high. The language is clear and concise, yet does not rely on jargon, and the guide covers all aspects of the machine needed by the Electron enthusiast. Certainly a book worth looking for.

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*ERROR ON will trap errors in a program and enter the EDITOR at the statement generating the error, no more wading through multi statement lines trying to identify the error.

Commands pioneered by BROM are:
*ROMON & ROMOFF which enable you to turn on/off sideways ROMs so that they stay off even after CTRL/BREAK. This also allows the DFS to be swtiched off and PAGE reverts to &E00 automatically.
*CASE which forces input into upper or lower case irrespective of caps/shift lock.
*FLIST which lists a program one statement to a line but more importantly it will even list 'BAD PROGRAMS'.
*ONEKEY is a single key entry option but you can also define your own strings to any ASCII key, just like an extra 48 function keys.
*FIND, *CHANGE & *SCHANGE provide selective or global SEARCH and REPLACE facilities. These commands work with strings and keywords or a mixture of both e.g. *FIND PROChelp T', will list the full line containing PROChelp, the 'T' simply tokenizes any keywords.

Yet another group of commands allow lines to be moved or copied to a new location.
The other commands provide function key editor, 'BAD PROGRAM' cure, variable lister, integer variable flush, program compacter etc.
This is a genuine useful ROM that no user should be without. Be warned, once used you will not be able to live without it!
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ROMS/BOOK

SEMI-TAILORED TOOLKITS

'Probe 2', £49, and 'Enigma Disc Imager', £49, Altra ROMs, 209 North Street, Leeds LS7 2AA.

There seem to be more and more toolkit ROMs available for the BBC micro as the months go by. Nobody has yet hit on my ideal selection of routines, but even it they did, it's unlikely they would suit every Tom, Dick, Harry and Bruce. Two further attempts at satisfying all requirements are on offer from Altra ROMs – one aimed primarily at the Basic programmer and the other concentrating on disc utilities.

Probe 2 is a revamped version of an earlier toolkit, *Super Utility IV*, in a 16k ROM. Its main claim to fame is a versatile Basic editor. While this isn't a full-screen editor, it does provide many useful facilities. It includes a comprehensive search and replace facility, a cross-reference lister which will display the line numbers of any lines containing pre-defined variables, and a packing routine.

This last utility offers options to remove spaces and comments, to concantentate lines where possible and to automatically rename variables, functions and procedures with one or two letter names. If you choose all the packing options, there can be a considerable reduction in the length of your program.

Also included in the Basic editor is a formatter which will split multi-statement lines and indent loops and conditional statements properly.

As well as the Basic editor, *Probe 2* contains a dissassembler, a memory editor, a disc sector editor and an assembler formatter. The first three of these are pretty much as you'd expect. The formatter is a bit more unusual as it takes an existing assembler listing and sets it out in an easily readable form, with addresses, mnemonics, operands and comments all very nicely tabulated.

Other shorter routines cover function key editing and ROM management, and there are several disc utilities (to format, verify, repair and examine discs). There's a simple, full-screen graphics dump for Epson and NEC printers, which I mention only because I own an NEC and was interested to find that someone else does too. A separate routine is included to set up various printer features directly on the NEC, but every time I issued one of these commands, the printer did a form-feed, followed by a reverse form-feed – something I wasn't aware it could do!

The *Enigma Disc Imager* is another 16k ROM, providing a lot of useful aids for those using discs. As well as a formatter, which is slow but can format any number of tracks, can do both sides of a disc in one go and format a dual (60 name) catalogue, the ROM provides comprehensive read and write facilities for oddly configured discs. Add to this a copying routine which will cope with quite a few 'mean tricks' on the part of software producers, disc sector and ID editors, and tape to disc transfer routines, and you can see that there are few things (from a technical standpoint) that *Enigma* can't be persuaded to do.

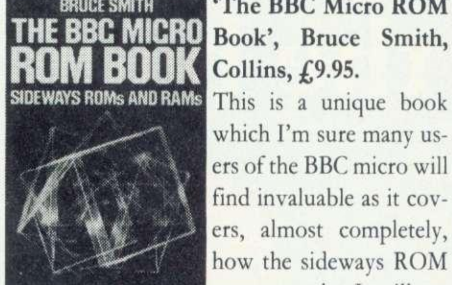
Several of the commands in *Enigma* have interesting extensions. For instance, the *ROMID command will normally list any sideways ROMs in your micro, with their sideways page numbers, titles and copyright strings, but if you add the page number to the command, the ROM will be copied into RAM automatically. If, instead, you add a drive number, the currently selected disc will be searched for ROM images and you will be prompted to load one of them. Similarly, the *VERIFY command will verify the current disc – all you have to do is just add the appropriate parameters.

Enigma is intended for more specialist use than *Probe 2*, but still contains quite a few facilities in common with the other chip. There are, in fact, nine routines shared by the two ROMs, including the disc formatter, memory and disc editors, dissassembler and block move routines. While each of these utilities is valuable in its own right, I do feel that this amount of overlap between products is unfair to the user. If you look at Altra's other ROMs, you will find that *Probe 2* is also available in two parts – the Basic editor and the rest. The routines themselves are well up to scratch but, apart from one or two high spots, offer nothing exceptional. The price asked seems steep, even allowing for 16k of code.

If this idea of selling different combinations of routines in EPROM is taken to its logical conclusion, you come to the custom EPROM toolkit. Under this system, the user would select a combination of routines (by length of code or price) and the supplier would blow them into an EPROM, thus tailoring the product exactly to the customer. Then I could have the complete set of programming aids I really want. And so could Bruce . . .

Simon Williams

A RUN AROUND THE ROM



'The BBC Micro ROM Book', Bruce Smith, Collins, £9.95.

This is a unique book which I'm sure many users of the BBC micro will find invaluable as it covers, almost completely, how the sideways ROM system works. It will appeal both to those who like to know how their micro works and to those who wish to write their own sideways ROM software.

Writing your own software is not that difficult and now that EPROM programmers are becoming cheaper (or through the use of sideways RAM) I'm sure many will want to have a go. For the practical types a simple circuit, plus software, for an EPROM programmer is given in the book.

The book is in four main parts, First the operating system routines which control the sideways ROMs are discussed; all the service calls (including those for the ROM filing systems) are described.

Unfortunately there is one error – Acorn DFS does not allocate &E00 to &1900 as absolute workspace; &1700 to &1900 is its private workspace. One omission is how utility ROMs can generate error messages which can be read by language ROMs. The usual system is to put them at the very bottom of the stack (&100 upwards).

The book goes on to a very useful and detailed examination of two commercial ROMs and one developed within the book. This should give ample information and ideas on writing your own ROM software.

The third section has a look at the range of commercial utility ROMs which are available, especially Basic toolkits and machine code monitors. It's unfortunate that the picture of Beebug's new *Help ROM* shows a mistake in the ROM.

Finally there is a section containing bar code listings of all the major programs within the book – very useful, as I'm sure this form of software distribution will quickly catch on. For those who prefer, the programs are also available on disc.

In summary, then, apart from a couple of minor omissions, a most useful book.

Richard Harris

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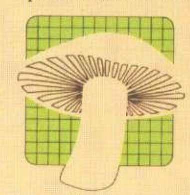


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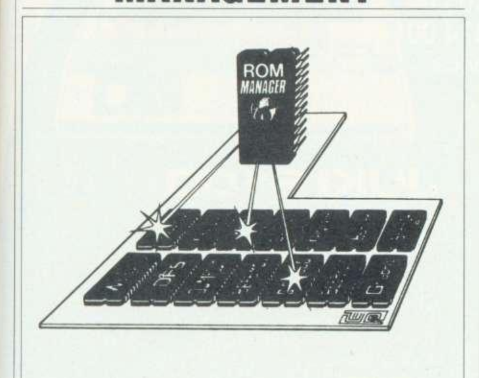
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REVIEWS

FIRMWARE

UNDER NEW MANAGEMENT



'ROM Manager', Watford Electronics, £25.30

ROM Manager has been designed to help those who use sideways ROM software on their Beeb, whether or not they have one of the many expansion boards available. For ROM development work, user RAM can be set up to act as if it were a ROM, thus saving the extra cost of sideways RAM. Also provided is a help text for the first few *FX commands.

The chip requires only five bytes of user memory (which appear to be unused by the OS) so no problems should arise.

On to the commands. *CHECKSUM generates a standard checksum, as used by the tape system. If you think a ROM may be faulty, this can be used to check the data.

*DIRECT and *VECTOR are equivalent commands which are used to send the given command to a certain ROM. This alleviates the problems associated with ROMs which may have the same command names. There are two names in case one clashes with itself!

*EXAMINE is next. This produces a colourful mode 7 dump of the contents of the required ROM, displaying the bytes in hex and ASCII, plus full instructions for use.

*EXPLAINFX is a help text for the first 22 FX commands. Although it can prove very useful, it looks rather like a space-filler.

*FILE is provided to pass commands to the active filing system (not to tape). This is in case a sideways ROM intercepts the command that should go to the filing system for action.

*INCLUDE is the command to allow the use of normal user RAM as a sideways ROM emulator. *REMOVE stops this action; *RAM sends commands directly to it.

A memory editor, invoked by *MODIFY, is similar to *EXAMINE in format, displaying in hex and ASCII. *NAMES provides a list of the different ROM software you have available, along with its socket number, and whether it is enabled (*START/*STOP are used for enable/disable).

*STATUS will let you have information about a given ROM in more detail – where and what it is, its length, status, and which entries it has (language or service). *VALUES will tell you what may affect *ROM Manager,* as well as displaying the active filing system, and whether the RAM option is being used.

Finally, you can specify a default ROM, to which *DEFAULT will send commands.

All this may sound a little confusing at first, but a reading of the manual, which is good, will have you talking to *ROM Manager* like an old friend, which it may soon become. If you have a lot of ROMs (or a large sideways RAM unit) you will have to consider *ROM Manager,* because of the features it provides. Some of the contents are provided elsewhere but at £25.30, it is fairly good value.

Stuart Menges

DESIGNS ON SCREENS

'Screen Handler ROM', Microsolve (Bolton), 60 Birches Road, Turton, Bolton BL7 0DX, £29.95

One of the less frivolous uses to which home computers can be put is the storage and maintenance of small databases, such as lists of names and telephone numbers, gramophone records and books. Many commercial databases exist for this purpose but are always something of a compromise, as on the whole they will have been designed to have as wide an application as possible.

In any particular situation, they will almost inevitably lack some facilities the user would like while offering others he doesn't need, but which complicate the use of the database. If keeping a record is the main requirement and no elaborate manipulation of the data is required, then there will be some people who are happy to write their own storage programs. The use of commercial programs will also be precluded, generally, where there is a requirement to vary the screen mode to modify the form of the screen display input screens once the database has been set up.

Just about any program which requires data to be typed in will benefit from a well-designed screen. This will allow information to be displayed and entered unambiguously rather than involving just a series of repeated prompts on a screen that scrolls upwards every time the return key is pressed.

The Microsolve *Screen Handler* is a ROM-based utility which can handle text input and output on the screen of the BBC model B. It is designed to facilitate the design of data input/display screens and since the routines are in ROM there will be some saving in memory. It takes advantage of the fact that it is possible for a sideways ROM to have both language and service entry points. Screen design is treated as a language and can thus benefit from a 6502 second processor's speed, if fitted. Subsequent screen display is controlled by service calls to the ROM which can therefore be incorporated into the user's own programs in Basic or any other language.

The ROM is straightforward – there are just five * commands which permit the design of screens and the input and display of data.

*SCR1 prompts for the screen mode to be used and allows a screen to be designed simply by moving the text cursor keys and typing in the words required. Screen positions for the display of variable data such as record numbers are marked at this stage with a string of ~s, fields for data entry are marked with a string of ^s. A completed screen may also be edited while in this mode, using the function keys to insert and delete lines. The completed screen is then saved on tape or disc, ready to be incorporated in the user's own programs.

The remaining commands, *SCR2 to *SCR5, are accessible within the user's program, to display a screen, display data, accept data and highlight individual fields. A sample program, included in the documentation, makes clear how each command is used – for instance, the highlighting feature can be called to indicate invalid inputs. Some memory must be allocated for the storage of the skeleton screen and for temporary storage of input data and display data. The instructions do not make it absolutely clear how much memory to reserve – I assume that it will depend on the amount of text on the screen. About 300 bytes was adequate for the examples I tried.

The *Screen Handler ROM* certainly makes light work of designing data input and output displays, but while many programmers could use its facilities from time to time, the price is likely to deter all but those who frequently need to design different data screens.

Malcolm Banthorpe

ROMS

A SLAVE TO THE SLAVE

Slave, A & F Software, £49.95

Slave is not the first tookit ROM to appear for the BBC micro – indeed, in recent months there seem to have been a plethora of them. What makes it a bit different, however, is the fact that it's in a 16k EPROM, rather than the more common 8k variety. This should offer scope for a larger range of utilities than normal and, if A & F has done its job right, should mean you can dispense with two other 8k chips, one for Basic routines and the other for machine-code. So does *Slave* achieve this?

Slave provides 31 new 'star' commands, divided about equally between Basic and machine-code routines.

Perhaps the most valuable Basic routine is the dynamic editor. This is a proper screen editor, which allows you to scroll backwards and forwards through your program (rather slowly) and edit it on screen. Each edit must be completed with <RETURN>, but as long as you remember this, you should find that the editor speeds program development.

In addition to the editor, there is a search and replace facility which will change variable names and the like intelligently within your program, and a cross-reference routine which shows you where you've used them before.

Slave includes the obligatory *BAD 'Bad program' cure, but this time with a an *EXTEND command, which will tack any lines of Basic existing in memory onto the end of your current program. Useful if you find you've NEWed a program by mistake, and started to type over it.

You also get an envelope definer, a key definer, a user character display and a machine code sort which you can call in and use on your Basic arrays. It will handle single dimension arrays of integer or real numbers, or strings, and works pretty quickly. The *TRON command traces your program, but confines its output to the top left-hand corner of the screen. It also single-steps your program for you. *PAGE will shift a Basic program to another page boundary, and is useful for relocating long Basic programs from disc. *Slave* allows you to auto-run them after relocation.

Finally among the Basic utilities is a program packer. This will remove unwanted spaces and comments, but doesn't abbreviate variable names like some similar routines.

On the machine-code front, *Slave* sticks mainly to the 'biggies', though implements them well. There's a hex dump, a monitor (including a disassembler) and a debugger. Each of these makes use of colour highlights to distinguish the various parts of the display. You can scroll backwards and forwards through any of the displays, including the disassembler. This is because *Slave* can disassemble backwards which is pretty rare!

These three routines provide a pretty comprehensive machine-code development package, and you can in fact move directly between the hex dump, monitor and debugger. You can also direct a disassembly to screen or printer.

Other machine-code facilities include *SLOW which slows the processor down. The manual provides the novel idea of using the command to make impossible games playable. *GET will find a given string of bytes and *MOVE – you've guessed it – will move a section of memory to another address. *REL will relocate a piece of machine-code, changing internal addresses to suit, but leaving external ones alone.

As well as the memory manipulating routines, there are a few disc utilities included in the chip. A disc sector editor allows the usual editing of information on disc, but is unusual in displaying in mode 3, thus showing more information than some similar packages. *DGET does on disc what *GET does in memory and *SPACE tells you what room is left on your disc.

A & F even provides a simple ROM management display, although unfortunately it is just a display. There's no means of disabling a ROM from within *Slave*, which is a shame – perhaps there wasn't room. There certainly seems to be plenty going on in *Slave's* 16k of code.

The 'Slave Driver's Guide' is a 70-page affair which details all the routines well, giving a fair amount of technical information where it's needed. It's organised roughly by function, although I didn't find it particularly easy to work my way around. The whole thing is printed in brown on white, and includes a number of helpful examples of the use of *Slave*.

So will *Slave* do what two other toolkit ROMS will do? It certainly provides the main routines you might expect in a machine-code development package, and the inclusion of the full-screen Basic editor makes it attractive. I think I'll find *Slave* very useful.

Simon Williams

A ROM TO REMEMBER

'The Buffer and Backup ROM', Watford Electronics, £22 + vat

This ROM has some rather useful functions which BBC micros owners with printers and, to a lesser extent, disc systems could use.

The 'buffer' part of the title refers to a Centronics-only printer buffer, for those with 'sideways' RAM fitted. The buffer can be up to 15.5k, depending on the amount of RAM present. *FX5,3 is used to select the small routine, which is place in the RAM. This saves the cost of a printer buffer, which could be rather expensive. Now, you are able to get on with important work while your listings are printed for you. Output may be stopped at any time by pressing Break which also tells you how much space there is left in the buffer area. (*HELP BUFFER also does this.)

The other commands available are of less importance, but can also save time and effort. *VAR lists all variables in use, with arrays displayed as sizes only. *TCOPY is a tape to tape or tape to disc copier, which is quite effective. Whether tape duplication should be encouraged is another matter, but Watford does state that the command should not be used for illegal copying.

Like *TCOPY, the other utilities provided are Basic files run under the ROM filing system, which is booted using Space-Shift-Break. A menu appears quickly, offering *ROMLOOK, *D-TAPE, and DSKMENU.

*ROMLOOK will copy the contents of a selected ROM socket to user RAM, from &3000 upwards, listing the contents in hex and ASCII. Unfortunately, single hex digits are not padded with leading zeros, so the display becomes ragged and looks rather messy. *D-TAPE is a disc to tape copier. You build up a list of the files to be duplicated, and then you copy them. Fairly straightforward.

Finally, a disc menu is provided, for use on each disc you have. This is quite good, but could be expanded to allow more than just Basic files to be run.

Altogether, this a useful ROM if you need such routines. It contains nothing unique, but all the commands can make life easier for you and it is good value. As with all Watford manuals, the documentation is well produced and easy to understand, even if you are a beginner.

Stuart Menges

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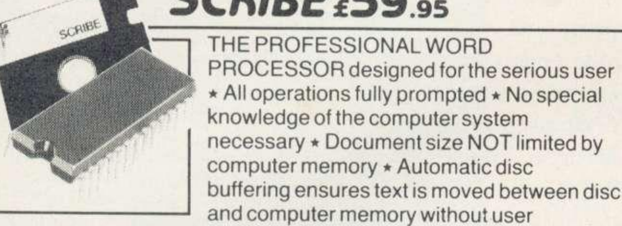
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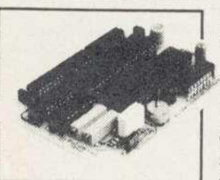


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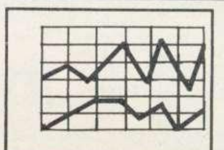
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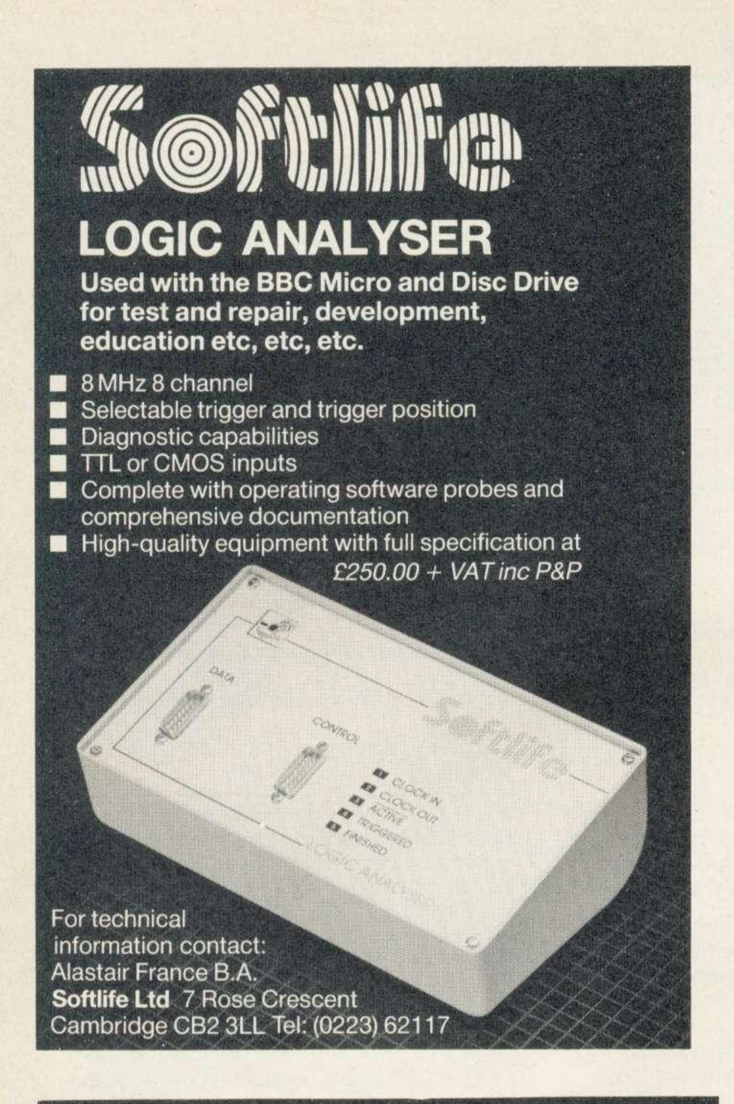
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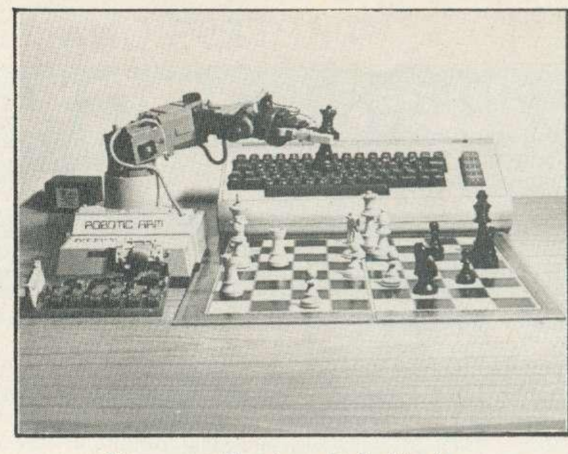
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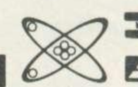
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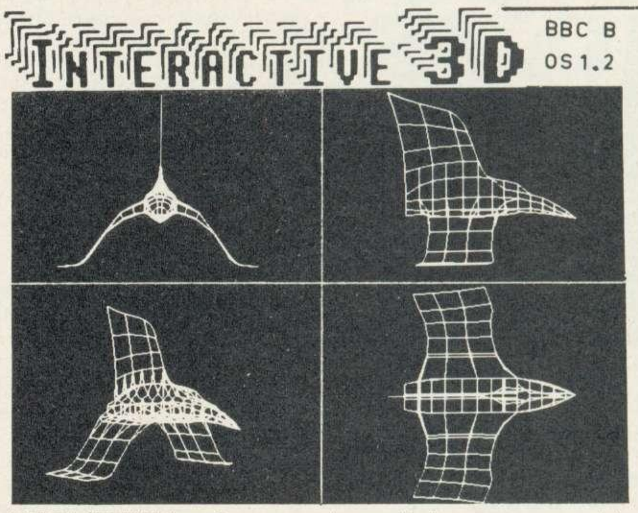
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HARDWARE

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First to the Penman plotter. The package contains the plotter, cables, power supply unit (PSU) and pens; user manual; utilities disc and manual; paper and platten.

The Penman is a plotter with a difference. As well as performing as a straightforward plotter, it can also be used as a robot, a Logo turtle or a mouse, depending on the task you wish to perform. A problem is finding room for the Penman, as it's platten for A3 paper, base unit and connecting leads need much table-space.

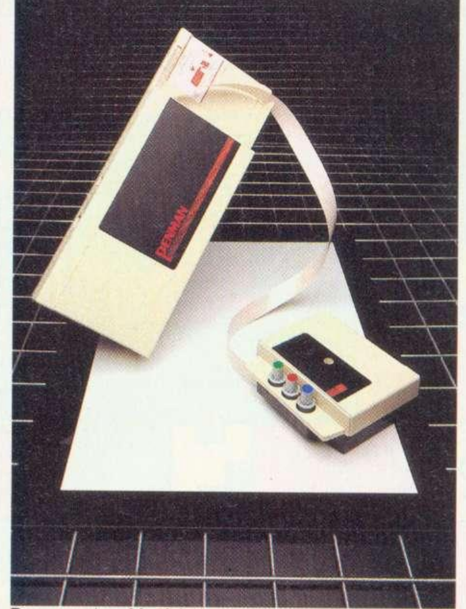
Following the Red section of the user manual, I set up Penman. The first stage is to run a self-test, and this should be done each day on power-up, or after temporary disconnection.

The Penman unit separates into a mobile robot head which performs all the plotting, and a base unit which handles the passage of instructions between robot and BBC micro. The base unit is remarkably 'smart', as it contains its own microprocessor, ROM, RAM and I/O devices.

There are three pen-wells at the front of Penman. The package contained four sets of pens (two with 0.3mm tips and two with 0.7mm tips) which included the colours black, red, blue and green, and 50 sheets each of A4 and A3 sized paper.

Penman incorporates a simple self test facility when it draws three coloured circles on a sheet of white paper. Once this is completed the unit is ready to be connected to the Beeb.

This requires a Green Card to help with orientation of the RS423 connector. Unfortunately there is no immediate way for a new user to actually test the lead, other than by referring to the software pack configured for the Beeb. This software is on a 40-track utility disc, and the first thing you should do is back it up. There is also a utility disc guide which explains the function of all the software quite well.



Penman: 'an ideal introduction to communications and robotics as well as plotting'

To check the operation of Penman, I decided to go for a program called PENTLK, which allowed me to use the BBC micro as a dumb terminal to talk to Penman.

Having ascertained that all was working properly I turned to the green section of the user manual. The introductory tour shows that it can swivel its body while drawing a perfectly straight line, can draw perfect circles from a single command, and just as you think it is about to choke on its umbilical ribbon, it unwraps the cable and speeds off on its way.

One frustrating facet is that Penman must repeatedly align itself with the edges of the paper. This is called homing and takes about 20 seconds each time.

If one wishes to become an expert 'Penowner', then one must understand how Pentalk (my name for the language which Penman understands operates. Penman returns a comment on everything the user sends – commands which it obeys successfully are flagged by a <CR><LF><!> string being returned, while problems are flagged by a <?><BEL><!> string.

Penman detects the baud rate which you use for communication, and responds at the same rate. One problem is that it is easy to send a string of characters to Penman which causes it to hang up, plaintively beeping. The solution here is to reinitialise with <I><CR> then start again.

For most people, the aim of the game is to get Penman to produce neatly drawn screen plots on paper, and Penman Products oblige by producing a 10k library program which the user can merge into a graphics program to draw the graphics required, but I found this package hard to use. It's very large and cumbersome, and I was unable to use modes 0, 1 or 2. Also, it is written in Microsoft Basic, and converted with much redundancy into BBC Basic. I appreciated the fact that the utility disc listing is in the original Microsoft Basic and so understandability of listings is maintained.

The third problem with talking to Penman



This colourful trio of cartoon dogs was plotted by Penman. As well as functioning as a plotter, Penman can also be used as a robot, a Logo turtle or a mouse

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via the Basic procedure library is that I still needed to work in Pentalk, so all my concise Basic for ever-so-clever graphics had to be rewritten to output strings to the serial port.

The user manual also explains the robotics mode of Penman, by which direct control is gained of the pens and motors.

The turtle graphics extension included with the review version of Penman was intended for Acornsoft Logo, although Logotron and LSL versions are in the pipeline. Following the getting started information seemed easy enough, except that you are told to LOAD "PENDRIVE which can't be a disc filename as it is eight characters long. Worse still, there wasn't anything like PENDRIVE on my review disc. I plumped for LOAD "BBCLOGO and sure enough – success! Actually, a short while later I found a reference card with the correct instructions.

My success was accompanied by a slight complication, which was caused by the method used by Penman Products to integrate their drivers into the Acornsoft Logo environment. They seem to have rewritten some Logo primitives in Logo itself, resulting in not much Logo workspace being left available in a standard BBC micro.

Although there is a central penwell, the Logo software provided accesses the three main pens, and changes between these are accomplished by the Logo command SETPC n. The commands are explained in detail in the well-written utility guide which accompanies the disc.

The end result of Logo plotting with Penman is well worth the small effort involved in setting up the environment. It is an ideal and enjoyable way of producing plottings, extremely easy to use, and is the place for new Penman users to start controlling their plotter.

The mouse utility could be the first one seen by a user, because on booting the utility disc, the mouse menu appears, and all the other options can be selected from it.

When in Penmouse mode, the screen cursor moves up and down the screen in response to Penman being pushed forward or backward. To make the cursor move left and right, Penman must be rotated like a tuning dial, clockwise for right and anti-clockwise for left.

The whole thing is pretty impressive, but users should remember that Penman is less manoeuvrable than a small mouse and doesn't have buttons, so you need to practise before becoming an adept Penmouse driver.

Also included in the pack is a CAD (Computer Aided Design) software suite called MICAD published by Ellis Horwood. It is configured for the Penman plotter, and comes on two 40-track discs and is simple to use. It can produce good quality technical drawings for demonstration, education or preliminary proof drafting.

I was impressed by the customer support, documentation, and completeness of the package. In these hard times a package which covers the applications of several peripherals must be good value for money, especially as a CAD package is bundled with it.

On the minus side, the method of setting up and maintaining accuracy by repeatedly homing was quite tedious, and the inaccuracies in pure plotting without using this were very noticeable indeed.

I was also concerned that I would never manage to drive/understand the beast from BBC Basic. The approach used and the listings provided are quite confusing, particularly because of the relationship to Microsoft Basic.

At an in-depth level the idea of curve-drawing instructions is excellent, but users must work on the idea of Binary Angular Measure (BAM) which is scattered through the user manual.

Plotmate

The Plotmate plotter consists of an A4 sized plotter, mains and connection cable, a 40-track software disc, a demonstration disc, an A5 ring-binder user guide, two sets of pens plus a pack of paper and some overhead projector (OHP) transparencies.

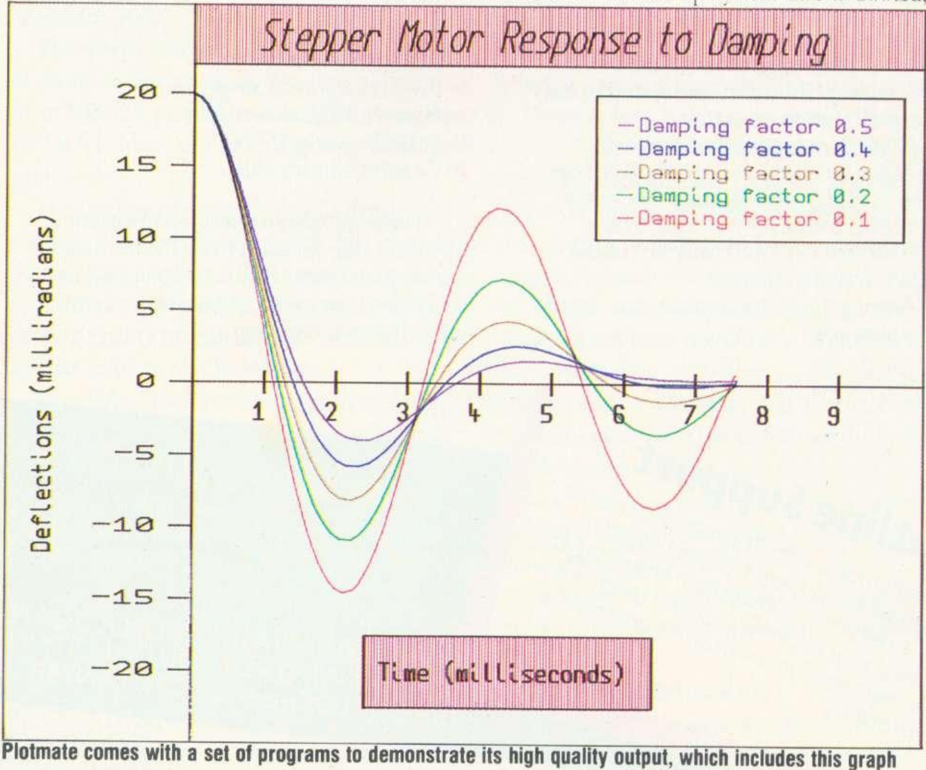
The user guide is extremely readable, and explains everything clearly, in stages, and related exactly to what is loaded from disc and seen on screen. Linear Graphics has aimed this manual at the naive user who wishes to become an expert 'plotmater'.

Unlike Penman, Plotmate's pen is moved in x and y directions over the paper by a two-dimensional mechanism using an arm which protrudes from the body. The paper is held by two magnetic strips which are firm enough to hold the paper without slippage. Linear Graphics also warns that the strip is sufficiently magnetic to upset floppy discs, and so shouldn't be used to hold them in place!

Plotmate has one pen-well compared to Penman's three, and consequently only one pen can be used at a time – not a disadvantage because of the very fast plotting speeds.

Plotmate connects to the BBC micro via the user port connector, although a parallel port version is available. Once powered up, Plotmate remains inert until driven by its system disc which contains three sets of programs, one set of demonstration programs, and two slightly different sets of Plotmate driving programs.

Once the backed-up system disc is booted,



Plotmate comes with a set of programs to demonstrate its high quality output, which includes this graph

by pressing Shift-Break, the Plotmate menu appears on screen and Plotmate can be controlled directly from the function keys.

There are two versions of the Plotware, prefixed with directory extensions H (high) and L (low). The H.PLTMATE program sits in mode 4 screen memory, and allows only mode 7 to function, while L.PLTMATE sits just below mode 4 memory, allowing modes 4,5,6 and 7 to be used. The design philosophy is simply that while plotting there is no need to have simultaneous display on screen and paper, so it uses the memory normally allocated to screen to house the Plotmate drivers.

Also, with the exception of simple commands like enable, disable, penup, pendown, parkpen, homepen and follow cursor keys, all the graphics commands for drawing already live inside the BBC micro and are interpreted in any graphics-using language to strings of bytes which are sent to VDU drivers. As these bytes are intercepted and decoded for Plotmate, then user software rewrites are minimal, Plotmate can be driven from any language and it can interface directly to almost any application program. I cannot stress how important this is. Plotmate can do almost anything the BBC micro can do in terms of graphics, without special programming!

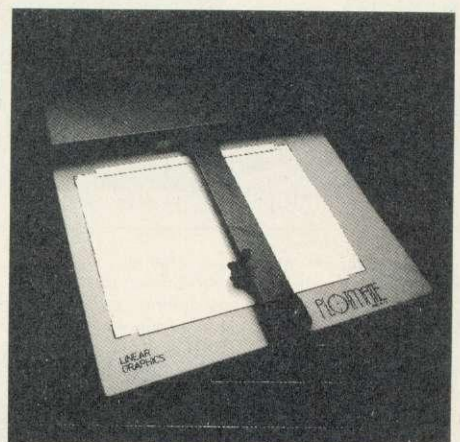
Before I examine the range of facilities available on Plotmate, here's a list of what it can't do: plot flashing colours, plot light colours over dark ones effectively, and change background colour (it takes hours to fill an A4 sheet). User-defined characters need special attention and the Graphics Extension ROM is currently unsupported.

Plotmate can decode many of the Basic graphics facilities, and their Logo and Pascal relatives as follows:

Draw x, y Plotmate's A4 page is mapped to a maximum co-ordinate system of 2854,1948 but this can be scaled to plot from a command like DRAW 1280,1023. If scaling is in effect, then the A4 paper must either have extra space in the x axis or less space in the y axis, because the aspect ratio of A4 paper does not match a TV screen.

Move x, y Move is interpreted as Draw but with the pen up.

GCOL When a GCOL statement is met, Plotmate prompts the user for a new pen. There is a slight discrepancy between pen colours and screen colours, but there are six available, and recent experiments with refilling used pens with other coloured inks extends the



Plotmate: 'for first time success, speed, precision and plotter facilities it's a good buy'

range further. It is possible to switch off the GCOL prompt if required.

Plot Plot is decoded in a variety of ways depending on the first Plot parameter. Move absolute or relative, draw relative or absolute, draw with dotted line, single point plotting, and, amazingly, triangle shading are all decoded correctly.

Print Text, etc, is only plotted if the graphics cursor is joined to the text cursor (VDU5). The text can be scaled, inverted, and italicised, as you wish.

VDU codes Most are decoded in the same way as on the BBC micro.

Setting any byte to 0 tells Plotmate not to change that byte – I'll just look at two very important bytes.

The special function byte handles a number of switches, for example, disabling the block fill of VDU24, plotting upside down, disabling GCOL facilities, and resetting other Plotmate parameters.

The shading parameter gives 15 densities of shading for triangle and block fill, plus 15 dotted line patterns. They can be used in conjuction to give 255 shading patterns. The shading facility on the Plotmate is remarkable and has to be seen to be believed.

Incredibly, despite complex graphics, almost any program can be configured for Plotmate by adding just three lines.

The Plotmate driver for Logo is virtually the same as that for Basic. In Logotron Logo and Acornsoft Logo, I simply typed two procedures called PLOTMATE and PLOTEND (16 lines in total and provided in the manual) and my screen turtle vanished until the plotter had finished. I had to type PLOTEND before using the Logo Editor, because it displays in the space where the Plotware lives. If the Plotware is not disabled, it could crash the Logo system.

In Logo as in Basic, Plotmate performed faultlessly, provided the two driver procedures were written correctly.

I had four minor niggles with Plotmate. The hardware needs an 'on' light which would instantly identify where the problem lies if the software is trying to do something and the hardware isn't moving.

An A3 version would be wonderful – A4 is just not large enough for some plots, but it is possible to plot in A3 by performing two A4 plots on the same A3 sheet, and carefully lining up the two halves.

Some means of user redefinition of the character set would be valuable, and should be possible as the character set must be somewhere in the software. I also have a feeling that most of the software could sit comfortably in sideways ROM – it's certainly small enough for a 16k chip.

The three things that I like most in a computing system are simplicity, integration, and reliability, and this package has all three in abundance.

The quality of plotting, even on very long drawings, was always spot-on, and the end result was most impressive, despite long shading times. Plotmate's construction is robust, and the plotter has a solid feel which encourages me to expect it to give years of trouble-free plotting.

Conclusion

So which should you choose? The two plotters are aimed at very different markets – Penman will be mainly attractive to school and college computing departments, Technical Vocational Education Initiative (TVEI) organisations and other training schemes, and a few hobbyists, whereas Plotmate will appeal to art and craft, and design and technology faculties, small businesses and some home users. Penman is an ideal introduction to communications and robotics as well as plotting, and much of my enjoyment came from learning about the product. Plotmate's emphasis is on plotting an end-product, and for first time success, speed precision and plotter facilities is a good buy.

Penman Plotter £249 (ex VAT)

Penman Products, 8 Hazlewood Close, Dominion Way, Worthing, W Sussex BN14 8NP. Tel: (0903) 209081.

Plotmate Plotter £299 (ex VAT)

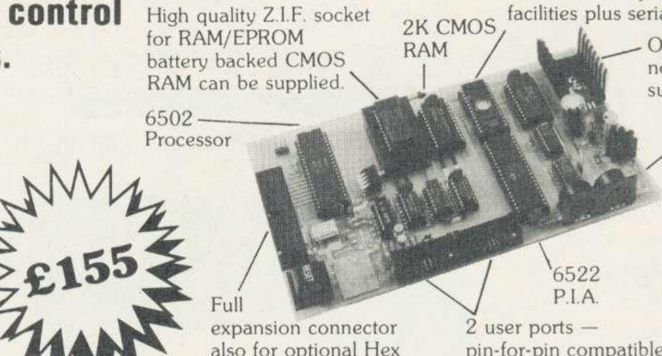
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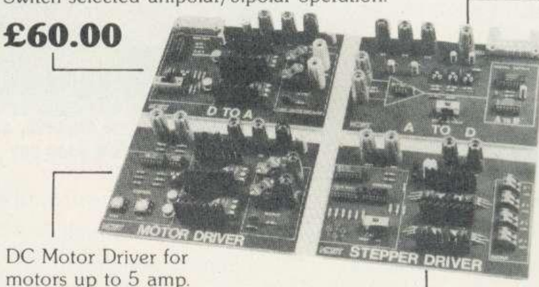
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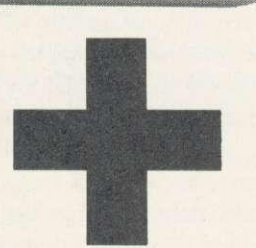
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REVIEWS

BOOKS

DIFFERENCES MADE CLEAR



'The BBC Micro Add-on Guide', by Allan Scott, Mike Scott Rohan and Phil Gardner, Collins Professional and Technical Books, £6.95.

In a phrase I wish I'd thought of myself, the authors of this book describe the BBC micro as 'the Peter Pan of the computer world' because it had been designed never to grow old. This 'infinite expandibility' was well illustrated by the series of ads on the TV with an impressive row of peripherals stretching off into the distance.

Those shown were from the Acorn range only, but there are many other add-ons available as well – in fact the Beeb is the second best supported micro (after the Spectrum) in the UK and the *Add-on guide* is a useful introduction to most of them, including those we usually take for granted, like printers, visual display units, and even keyboards.

Probably the most useful chapters are the one on extra storage – covering floppy tape and disc systems mainly, but also including some useful tips on getting the best results from cassette – and the one dealing with ROM/RAM expansions.

Other more exotic products discussed include robotics and control hardware; light pens, digitisers and graphics tablets; sound and speech systems; and joysticks and alternative keyboards. Communications – modems and networking – rates a chapter to itself, which also serves as a concise and worthwhile introduction to the subject.

Of course the problem with any book of add-ons is that it will quickly fall out of date: for the moment though, this one is pretty well up with the current range. What's more, much of the advice given here, such as the importance of adequate documentation and the warning note about connecting add-ons, will always apply.

Most importantly, comments on products available now will give the reader a good general idea of what to look for in the future – specific product information may date quickly, but sensible advice is timeless!

This book won't answer all your questions about add-ons – in fact you'll probably have more by the time you finish – but at least you'll know what to ask the dealer when you set off to buy a peripheral.

In fact about the only point on which the *Add-on Guide* is not helpful is where do you put all those gadgets after you've bought them? We don't all have desks 10 feet long. I do, as it happens, but not the money to buy all the goodies!

Ron Keeley

PERIPHERAL ADVICE



'Get more from the Epson printer', Susan Curran, Collins, £7.95

'Epson Printer User's Handbook', Weber Systems Inc Staff, Century, £9.95

These books are aimed at very different markets – the first sets out to be a guide to an Epson printer plus any micro, while the second is almost without reference to particular micros, and is really an extended Epson user manual.

Neither is the ideal guide to the Epson printers. Susan Curran has attempted to write a book which can be used by beginners, but has fallen into the trap of trying to be all things to all micros owners. There is really very little to interest the BBC owner in the packages and techniques needed for the QL and vice versa.

Further, the book is poorly illustrated, and manages to cover descriptions of seven printers, explain interfacing (in a rather muddled way) and connecting up, coding and controlling the printer without using a single diagram or program listing!

The programs provided seem pretty banal. Since the Epson printers are now produced with comprehensive and comprehensible user guides, full of program examples, there is little point in publishing listings which don't add anything new. The only exception is that the programs do include translations from Microsoft Basic into various dialects, including BBC Basic.

The coverage of packages is confused and not very helpful. Clearly the author's version of *Wordstar* is patched by an entirely different mechanism from mine and that in the *Epson Printer User's Handbook*, and her discussion of *SuperBase* adds nothing that the manual does not already say.

Ms Curran is not too knowledgable about graphics dumps. Discussion of 'pattern dumps' is vague, and all the examples are printed using a utility ROM on the BBC micro – quite how this helps the Commodore 64 or QL owner is far from clear! There is an awful blunder in the mention of the JX80 colour printer (reviewed in October), where the suggestion of changing on a 'bit-by-bit rather than line-by-line basis' is recommended. Even on a line-by-line basis my original dump using this advice took over 10 minutes *per line* and changing colour as suggested would have at least doubled this.

I do not think that the average BBC owner will find much of interest in this book.

The *Epson Printer User's Handbook* is American in origin. It extends many of the explanations in the printer manuals, and has a section on customising various software packages, including *Wordstar, dBASEII, Lotus 1-2-3* and *Symphony*. This may not be of great interest to the average BBC micro owner, but is very important to small businesses without professional computer support teams.

The remainder of the book is a thorough, though sometimes wordy, amplification of the printer manual. The text is presented in a logical order with chapters covering well-defined areas of interest such as pitch modes, weight modes, formatting output on the page and combining text modes.

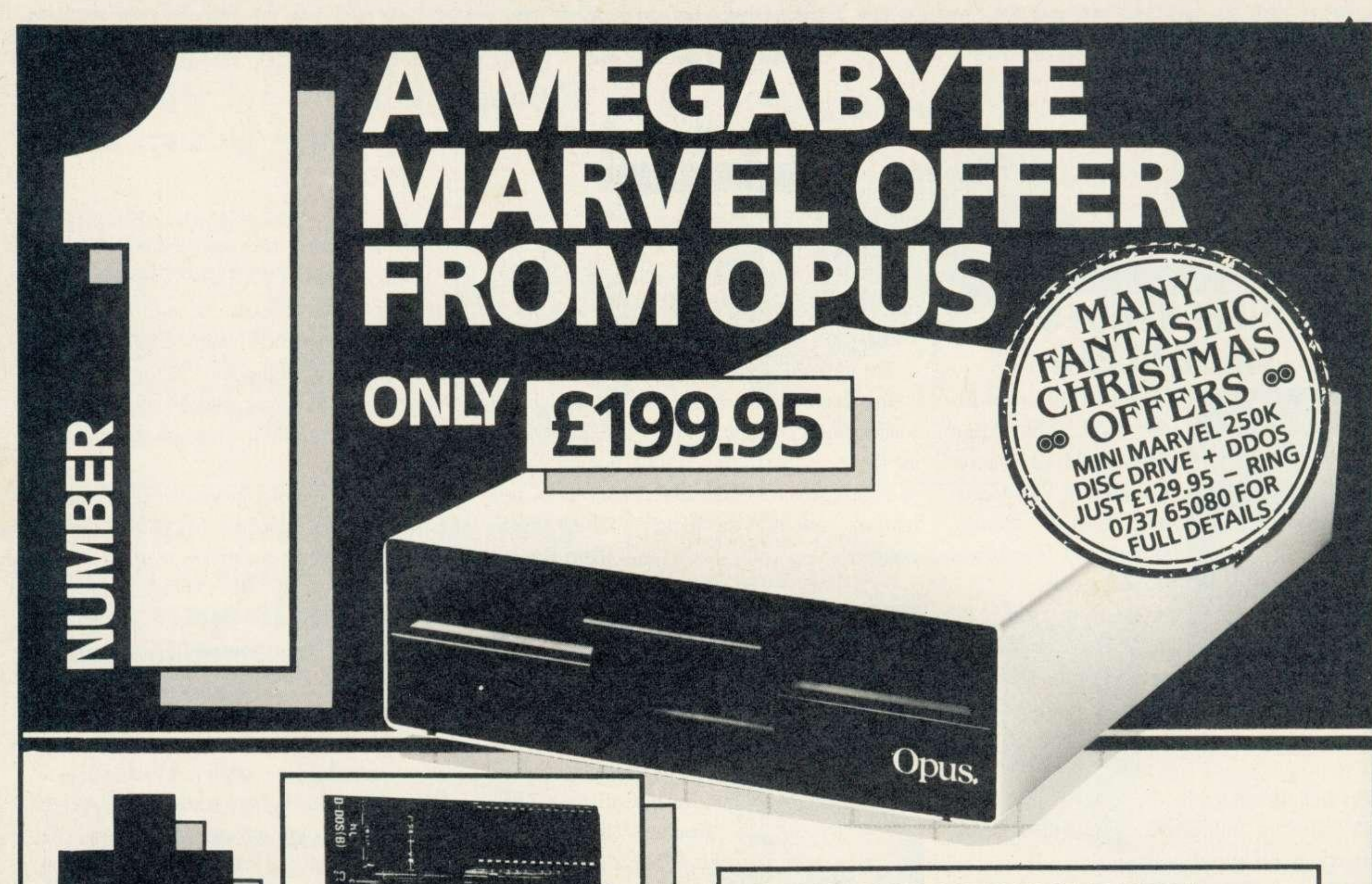
There is a good section on bit image graphics, though I cannot imagine typing the 124-line program recommended to produce a simple graph! The authors have restricted their discussion of download characters to a short chapter emphasising the planning stages not well covered in the manual, but have not produced extensive programs involving them.

All programs are in Microsoft Basic (ie, LPRINT terms), but there is a brief explanation in the preface on how to convert from LPRINT to *FX3 or VDU1.

Don't believe the cover, where it states that this book encompasses printer maintenance – it doesn't. Nor does it mention the JX80 at all.

Overall, a good meaty book and a useful adjunct to the Epson manual.

George Hill



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REVIEWS

PRINTERS

YOUR TYPE OF PRINTER

George Hill, Tony Quinn and Bruce Smith spend your money

Printers are the cause of more letters to *Acorn User* pleading for help than just about any other type of hardware. The problem is usually finding a graphics screen dump or getting the printer to work with a particular wordprocessor. So, although we hate to say it, it's best to stick to a standard type and force whoever is selling it to demonstrate it doing exactly what you want. It really is not worth the hassle to save even £50 if you get a printer and then spend months persuading it to work.

This survey will help you cut down the options, and unless you have a good reason for not doing so, stick to our guidelines.

Let's go through the choices and the jargon first. There are two interfaces which printers connect to on the BBC micro – serial (RS232) and Centronics parallel (printer port). The Plus 1 interface for the Electron has the parallel printer port fitted. The Acorn operating system assumes you are using a parallel printer unless you tell it otherwise, and they are more widely available and cheaper. Stick to parallel unless you want the printer in another room.

There are five different print mechanisms around under £1000 – dot matrix (or dot-wire), daisywheel, thermal, ink-jet and plotter. When choosing between these it's very much a case of 'horses for courses', but average users should stick to dot matrix.

Dot matrix

Cost is obviously an important factor, but you are unlikely to remain satisfied for long with any printer costing less than £200; quality, versatility and speed improve considerably as you approach the £400 mark.

What should you look for in a dot matrix printer? First make sure it can print 'near letter quality' (NLQ). This function is an attempt to copy the look of an expensive daisywheel printer while keeping some of the speed and versatility of the dot matrix. It works to a degree, but the style of the letters is very much a matter of taste.

The other factor governing the appearance of the characters is connected with the number of dot-wires in the printing head which forms the letters. Attractive characters are not possible if the matrix is less than nine deep by six wide, including dots below the line to form the 'descenders' (eg, j,g,y). The best 'letter quality' printers have an 18 × 12 matrix or larger, often printed in two passes.

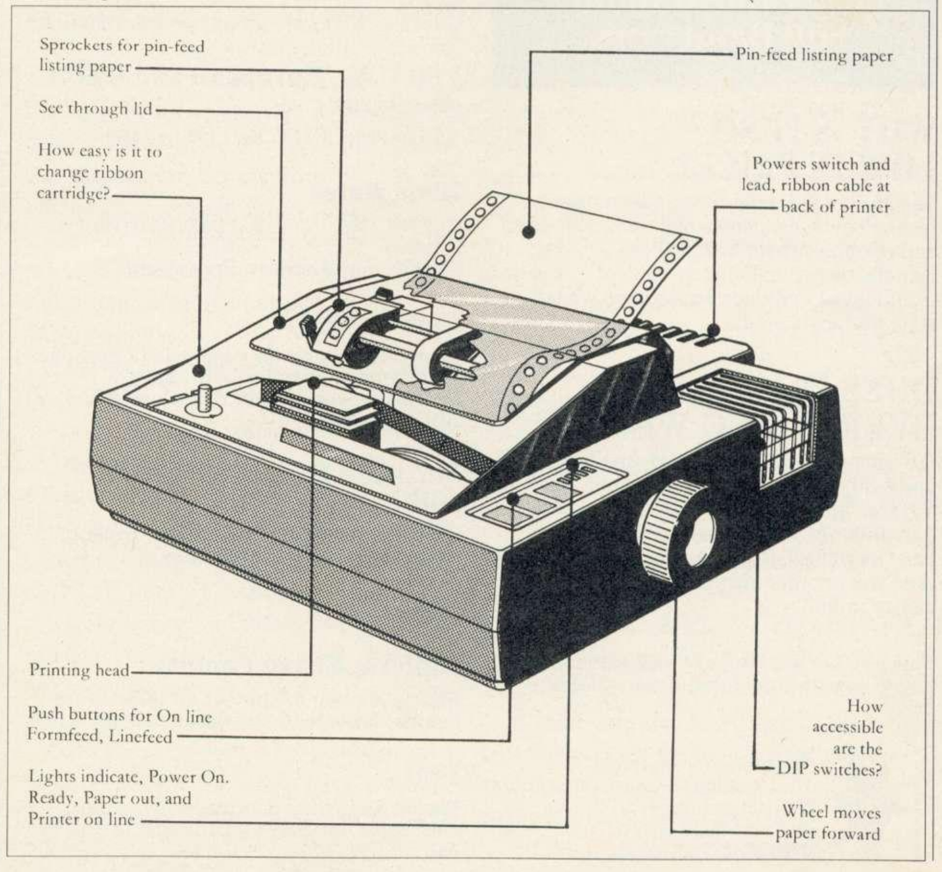
Dot matrix printers are all fairly fast, but if the speed is quoted at less than 80 characters per second (cps) you are likely to find it irritating at times. The speed in use will work out at something like two-thirds of the advertised maximum, so a typical dot matrix will have a quoted speed of about 100 cps, or about 66 cps in practice. The average English word has six characters, which works out to 11 words a second, and a page business letter will take half a minute. If you use the NLQ mode the printing speed will be halved.

Closely connected to effective speed is the size of the on-board printer 'buffer'. A large buffer can allow you to carry on using the computer while the printer gets on with a time-consuming printing job. Many printers come with at least 2k (about a page of text), which can be expanded. Also, sideways RAM can be used as a print buffer.

When it comes to printing graphics, be careful. A printer may have a good graphics facility, but if it is not the standard 'Epson' type, you may have a hard time finding a satisfactory screen dump, and writing your own, while instructive and fun, is time-consuming. Look for the 'double density graphics' function using the control code Escape L n1 n2. Most dumps published in magazines at present use this. See the explanation on page 18.

Many people are used to the sound of a typewriter, but a good typist only does 50 words a minute, while your printer will handle 600 in that time – and that makes the noise come in very concentrated bursts. If you're doing a lot of printing it can drown out conversations, especially if you're on the phone. So listen to the printer doing its boldest face for minute or two before buying.

In theory, feeding in paper should be no more difficult than on a typewriter, but some devious minds have been employed to ensure this is sometimes not so (one of the classic



examples being the Epson FX80). Also, some printers are prone to paper going through and then being taken back in which results in a messy jam. So, see how accessible jammed paper is and be careful when you leave the printer unattended.

Make sure your choice has a tractor mechanism for fan-folded paper with holes down the side for listings, etc, and friction feed for single sheets. Feeders are only necessary for specialised uses. The tractor feed should be fully adjustable for paper widths from 3 to 8.5in (standard A4 with 40 characters per line). Wider printers are available, but remember that most printers can squeeze up to 120 characters across an A4 page by using a condensed typeface. If you have standard stationery, test it out on any printer you are considering buying.

After a month of heavy use, the type will start becoming less dense as the ribbon wears out. So find out how easy ribbons are to find, fit and how much they cost.

Other choices

You should look at printer mechanisms other than dot matrix under the following circumstances. First, if your printer must produce output which looks as if it has been typed, or it must produce several perfect carbon copies. This indicates that you need a daisywheel. Beware though, the cheap ones are desperately slow (up to two minutes for a page), and cannot cope with graphics. Some thermal printers have very attractive near letter quality print available. These too are normally slow, but are usually quiet in operation.

If the main use for your printer is for graphics, with text as a very minor part of your work, then ink-jet technology is superior to dot matrix.

If colour is a necessity then an ink-jet printer or a plotter should be considered, though dot-wire colour printers are available.

If you buy a plotter – whatever it was called in the advertisement – it will remain a plotter at heart, and will not be satisfactory either as a graphics printer or as a character printer.

A point to note is that although there is a bewildering variety of makes of printer on the market, many of them use common mechanisms. There is, for instance, a whole family of printers using the CP80 mechanism. Most look the same, except for the labels, and they may actually be identical. There may be minor differences in the details of the control codes, but these will rarely be readily apparent, and are unlikely to be very important.

10 Point Plan

Buying a printer? Then let our 10 point plan provide you with the questions you should put to the dealer!

1 Centronics

The BBC micro and Electron have a Centronics printer interface. A printer must have one to enable you to use the printer port, if it does not then don't even contemplate purchasing it.

Some printers can be used in conjunction with the RS423 port. The only indication of this is when you wish to locate the printer some distance from your micro, eg, in the next room. As there is no RS423 port on the Electron this option is not available.

A centronics printer lead can cost an extra £17 to £24, so check to see if one is included.

2 Traction

Standard continuous listing paper is traction fed using holes in the side of the paper. Installing paper in this fashion is difficult on some printers so try it out. Check that paper is not re-fed through the printer feed.

Friction feed is a must if you wish to print on your own stationery, so take it along and see how the printer copes with it.

3 Ease of use

Consider the points above, and another question is how easy are the buttons to use?

Printers, like typewriters require a ribbon, you should find out if they are readily available, how easy they are to replace (try doing it yourself) and how much they cost. If you plan to use a wordprocessor, can the printer driver generator work the printer?

Do you need to use a wide paper (eg, to print spreadsheets) or print labels? If so, ensure that the printer can cope.

4 Dip switches

Get the dealer to show you how to use these to configure your printer for its mode of operation. Get him to explain how they work and then tell him to set them for you.

5 Print styles

Don't even contemplate buying a dot matrix printer that cannot produce near letter quality (NLQ) print. If you need to use italics, check the quality of those produced by the printer. This can vary a great deal, but because of the printing technique used by dot matrix printers it will never be very good.

Daisywheel printers can produce most typefaces but you'll normally have to change the daisywheels over at the appropriate point – get the dealer to show you how. This can become a time consuming operation, and it's expensive as you'll need to buy them.

Many printers also have a facility that allows you to define your own character set. This is useful if you wish to print characters from lanaguages such as Greek.

6 Printing effects

How easy is it for the printer to perform printing effects such as emphasised print and underlined print? If you are using it for statistical or scientific applications then can it print super- and subscript characters?

7 Graphics

Dot matrix printers can reproduce a copy of your screen using a graphics dump program, but this is not possible with daisywheel printers. Most printers come with a dumping program – check that this is the case. If not, take a program of your own, eg, George Hill's All Mode dump, *AU* December 1983 or the UserDump ROM (see page 102), and a disc or tape containing a suitable saved screen that you can dump and compare to other printers. If a screen dump program is supplied with the printer is it capable of producing a truly round circle?

8 Noise

All printers make a noise, but some are louder than others. The standard length of printer cable is about one metre, so you'll be close to the printer at all times, and if you envisage long print runs and frequent use of a telephone, noise is a major consideration. A lid will often dampen a large portion of the sound, as will a rubber printer mat.

9 Speed

Slow printers are infuriating. Check the quoted speed of the printer which is given in characters per second (cps). In practice the actual speed is 60 per cent of that quoted. The actual speed will be half this again when NLQ, emphasised or double strike printing.

A printer buffer is a must. You need not buy this as an extra, as most printers have an adequate one fitted – ensure that this is so.

10 Manual

Nine times out of ten you can judge the printer by its manual. The most popular printers are Japanese and so the manuals will have been translated into English. Read the first few pages in the shop – if the introduction doesn't make sense you are unlikely to follow the more technical details.

PRINTERS

Star

Star Micronics offers a wide range of dot matrix printers, including the SD, SG and SR series which are available in 10in and 15in paper width formats. All come supplied with a Centronics and serial interface as standard. Near Letter Quality (NLQ) is also a feature of each, and all offer Epson compatibility.



They are also compatible with one another, the only difference between them being the print speed. The SG10 and SG15 print at 120 cps; the SD10 (above) and SD15 at 160 cps; and the SR10 and SR15 (above) at 200 cps.

An on-board printer buffer ensures that your printer frees your computer as soon as possible. Installing paper is simple and the manuals are comprehensive and well written. Recommended retail prices including VAT are: SG10 £297.85; SG15 £447.35; SD10 £447.35; SD15 £562.35; SR10 £562.35 and SR15 £677.35.

Star Micronics, Craven House, 40 Uxbridge Road, London W5 2BS. Tel: 01-840 1800.

Epson FX80

The Epson FX80 dot matrix printer has become the unofficial standard for the BBC micro and Electron. It does not support NLQ print. At 160 cps it is comparable in speed to the Star SD range, but in practice it tends to have a slower carriage return.



There is little adjustment for paper width – less than half an inch in fact – so using smaller tractor feed paper or labels is impossible.

The FX80 (above) is supplied with a Centronics interface, but a serial interface is available at an additional cost. Fitting printer paper is diabolically difficult. The recommended retail price for the FX80 is £442.75.

The LX80 printer is the latest from Epson and is intended to replace the RX series.

Standard print speed is 100 cps, which falls drastically to 18 cps when in NLQ mode. A nice touch is that fonts such as emphasised, double strike, condensed and elite are also available in NLQ mode. A fully adjustable tractor that caters for smaller width paper and labels is available as an optional extra, at about £23. The price of the LX80 is £258.75 including VAT.

Epson, Dorland House, 388 High Road, Wembley, Middlesex. Tel: 01-902 8892.

Canon PW1080A/Kaga Taxan KP810

These two printers are virtually identical though the claimed speeds are slightly different at 160 and 140 cps respectively. Both support NLQ printing at 25 and 21 cps and this can be selected via a switch on the front of the printer.

A Centronics parallel interface is standard in both, with the serial interface an optional extra.

The Canon printer is the more expensive of the two, and although prices vary, expect to pay about £400. You should shop around for the Kaga (above) – Technomatics price, for example, is £270.25 inclusive of VAT.



Canon, Canon House, Manor Road, Wallington, Surrey. Tel: 01-773 3173.

Kaga Taxan, distributors: DDL, 5 Kingsride Park, Ascot, Berks SL5 8BP. Tel: (0990) 28921.

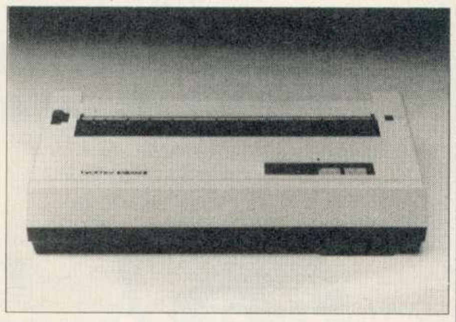
Brother

The M1009 (top right), the HR5 and the 2024L are all suitable for the BBC micro and Electron. They offer Epson compatibility, and are available with either Centronics, parallel or serial interfaces only.

At the bottom of the range is the HR5. This accepts either plain paper or thermal paper – both are supplied on rolls and are not standard. The 30 cps speed is rather slow, although the battery operation facility might be of interest. It costs around £177 including VAT.

The M1009 will take standard fan-fold paper but requires an additional pin-feed carrier costing about £20. A dual Centronics and serial interface is supplied as standard, and it runs at 50 cps. It is priced at about £230.

The 2024L comes with either Centronics or serial interface and prints at 160 cps. In addition to being Epson compatible, the flick of a switch gives a Diablo compatible mode. This is only available in 132 column mode.



A letter quality print is available, although it in fact seems to be an elite font. At about £1150 the 2024L is rather overpriced.

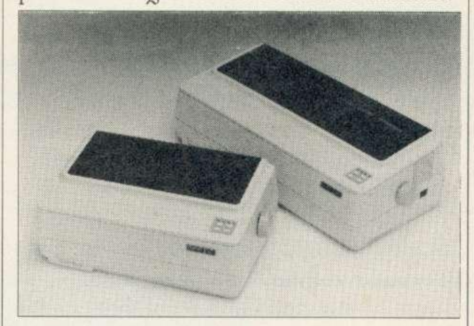
Brother Office Equipment Division, Jones & Brother, Shepley Street, Guide Bridge, Audenshaw, Manchester. Tel: 061-330 6531.

Mannesmann Tally

The MT85 is a useful printer. It is Epson compatible and has a print speed of 180 cps in standard mode, reducing to 45 cps in NLQ mode. The printer is very quiet.

Both Centronics and serial interfaces must be bought as extras, at about £23 each. Variable width friction and traction feed are available as standard. Special font cartridges can also be bought for about £21 each, thus giving you access to different types of print.

The MT85 will set you back about £400, plus an extra £23 for the Centronics interface.



The MT86 is the wider carriage partner to the MT85. It offers the same facilities but with a 136 column width for £516.

The MT290 is the latest printer from Mannesmann Tally. It offers a 132 column print width at 200 cps. As with the MT85 it is quiet in operation and accepts the printer font cartridges. Supplied with Centronics interface as standard, the MT290 costs £799.

Mannesmann Tally, Molly Millars Lane, Wokingham, Berks. Tel: (0734) 788711.

REVIEWS

HARDWARE

WORKING ON THE SIDE

Chris Drage brings you the latest on sideways RAM boards

There are four main reasons why you might consider purchasing a sideways RAM board in preference to a ROM expansion board. (If you're unsure what sideways RAM is, see Tessie Revivis' article on page 53.)

First, software purchased initially in ROM form may be transferred to disc and subsequently loaded into sideways RAM – particularly useful for network users.

By using additional software, the sideways RAM may be configured as a printer buffer which will free the computer from being tied up during printing (see Richard Harris' articles in the June issue.)

Sideways RAM may be used to develop sideways ROM-type software. By using the BBC micro's own machine code assembler and loading the resulting machine code at &8000, it can be used immediately as if it were in EPROM. In the course of development and debugging, considerable time can be saved as EPROMs do not have to be erased to make minor alterations to the software.

Finally, to use the sideways RAM as DFS workspace – this enables 2.8k of memory to be reclaimed (as PAGE is reset to &E00).

There are advantages in adopting the sideways RAM approach. Many more programs can be kept on disc than can occupy a normal-capacity ROM expansion board. Conflicts between ROMs are avoided because only one or two are ever loaded at any one time.

Solidisk was probably the first company to exploit fully the sideways RAM potential of the BBC micro. It markets a range of boards from a 16k card up to a 128k version capable of being configured as a 'silicon disc'. A 64k version is now available which can be expanded to a massive 256k. HCR Electronics markets a 16k board which can be expanded to 32k at any time by simply adding two RAM chips. Ramamp Computers produces a single 16k board which is proving popular in stand-alone systems and network workstations.

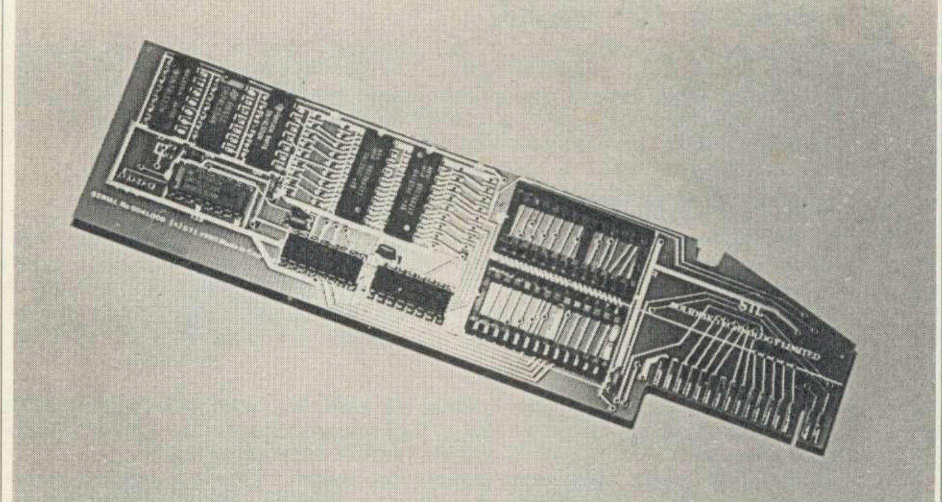
As you might expect, by increasing the sideways RAM pages to two or more a number of ROM-image programs may be loaded and be on-line concurrently. More importantly, perhaps, multiple RAM slots allow useful combinations of transferring software from ROM disc and use as a printbuffer. For example, a 16k printer buffer for use with *View* may be loaded.

When you buy a RAM board think also of future expansion possibilities. For example, you may wish to add an Aries B20 shadow RAM board at a later date, and it makes sense to purchase a sideways RAM board that permits a wide variety of expansion options.

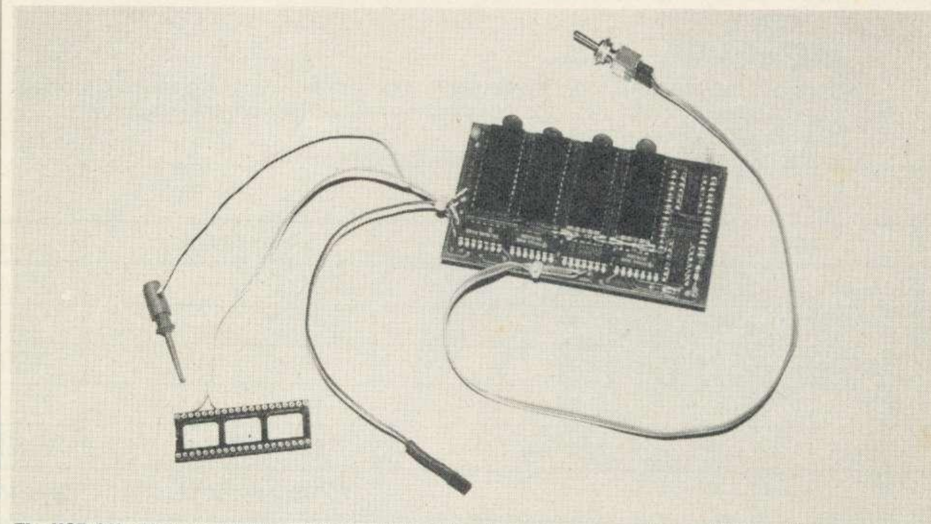
Solidisk

Solidisk Technology was the leader in this field. As 32k/128k RAM boards aimed at the hobbyist end of the market have proved very popular. The package contains a base unit, a RAM card, a ROM carrier board, a 68-page manual and disc-based software. The 32k board may be expanded to 128k at any time. The RAM board lies vertically beside the Beeb's RAM area and the case.

Installing the base unit is far from straightforward and not really a task for the inexperienced. The base unit plugs into the right hand ROM sockets, and it is so low that it's easy to position incorrectly or bend the ROM socket. There are also 11 leads to connect. Unfortunately, Solidisk fails to provide suitable sockets to simplify the task and unless you are experienced with the soldering iron you must resort to pushing the wires into the socketed legs of chips. The one socket that is provided is meant



The Solidisk SWR64 features two ROM sockets. It can be upgraded to 128k, or even 256k with a piggy-back board



The HCR 32k sideways RAM board 'is simple to fit thanks to the design and use of high quality components'

Robico Software



3 Fairland Close, Llantrisant, Mid Glamorgan. CF7 8QH Tel (0443) 227354

Brilliant Games for the BBC B

THE NEW TEXT ONLY, DISC-BASED MEGA-ADVENTURE!

ENTHAR SEVEN

It is the distant future ... You are on board a fragile Interplanetary Space Hopper which orbits a small, Earth-like planet known as Enthar Seven. Your task is to reach the planet's surface before the Hopper's orbit decays and the spacecraft spirals into oblivion!

Once on Enthar Seven, you must explore the planet and find and board an Escape Vessel.

Enthar Seven is written entirely in machine code and uses disc filing techniques to provide a massive scenario. The game has an advanced command interpreter which can understand complete sentences and multiple statements, and compresses the text stored on disc (using the same methods as in our acclaimed cassette based games) to approximately half its original length. When expanded there is well over 100K of text!

With 450 atmospherically described locations to visit, 80 objects to examine, an extensive vocabulary and approximately 1200 lengthy messages, we believe that Enthar Seven is the outstanding BBC adventure to date. The beautifully packed game costs £17.95 for the twin disc 40 track version and £16.95 for the single disc 80 track version.

ISLAND OF XAAN

Escape from the forbidding Island of Xaan by finding a disguise and enough treasure to pay your passage on a sailing ship. Machine code, text compression and about 180 locations make this a must for all adventurers.

P.C. Weekly: *"Whatever else is true, Island of Xaan must be the only adventure to come with a freebie that is worth having (Note Book) ... I suspect this could prove to be one of the best text adventures on the BBC."*

A & B Computing: *"Excellent game from Robico Software ... write more!"*

H.C.W.: *"The game follows the same format as the Level 9 and Acornsoft classics."*

RICK HANSON

As Rick Hanson, Special Agent, your mission is to assassinate an evil General and save the world from the final holocaust! Rick Hanson, a machine code, compressed text adventure, has 220 locations and an advanced sentence interpreter.

P.C. Weekly: *"Good to see there are still a few programs around that make you envious of BBC owners."*

A & B Computing: *"A game as near to my ideal as any I have played ... its mass of brilliantly written text has left enduring images on my mind ... if you want to know how good an adventure can be, buy (Rick Hanson) and find out!"*

BANJAX

Banjax is a machine code, arcade adventure with a massive 240 locations and brilliant MODE 1 graphics. These combine to give the "feel" of classic adventuring. Will Banjax the Bear enter the Inner Sanctum of the Golden Temple of the Land of Mystery?"

Your Computer: *"Some of the best graphics in a BBC game since Frak."*

Eagle & Tiger Comic: *"The graphics are very good indeed ... An interesting cross between Indiana Jones and Winnie the Pooh!"*

A & B Computing: *"The graphics are superb ... There are some delightful characters in this game ... All the locations are beautifully drawn and virtually every screen is different ... I strongly urge you to buy this game."*

Micro User: *"Banjax contains some of the best Mode 1 graphics I have ever seen ... A definite must for the kids that I recommend highly."*

BEELINE

This is a fun, machine code arcade game with smooth, colourful graphics, 18 playing screens, a practice screen, choice of starting screen, monitor and T.V. modes and two levels of play at a giveaway price!

S.W. Echo: *"I'll give it 10" (out of 10).*

A & B Computing: *"Nice graphics ... an enjoyable game."*

TITLE	CASSETTE		40 TRACK		80 TRACK		SUB TOTAL
BANJAX	£9.95		£11.95		£11.95		
BEELINE	£7.95		£9.95		£9.95		
ISLAND OF XAAN	£7.95		£9.95		£9.95		
RICK HANSON	£9.95		£11.95		£11.95		
ENTHAR SEVEN	NOT AVAILABLE		£17.95		£16.95		
Cheque or Postal Order to the value of:							

to straddle IC76, but it's inadequate. The board proved frustrating and difficult to get working correctly. I had to cut a section out of the Beeb's lid strut (and out of the keyboard with the 128k), just to make the system physically fit! Without this modification the main board flexed alarmingly.

The new 64k card is a considerable improvement on the above boards as it consumes far less power and features two ROM sockets. These assume higher priority over the other three sockets available in the Beeb and will take 8k, 16k, or 32k ROMs/EPROMs. Four RAM banks are available. The 64k board can be upgraded to 128k, but this is rather messy as it involves cutting a link, soldering a wire and adding two RAM chips. To upgrade further to 256k, a piggy-back board must be installed.

Only one serious problem has emerged – it is somewhat slimmer than the previous 32k unit and failed to make proper contact with the existing base unit, which is more a problem for those wishing to upgrade their 32k system than for the first time buyer.

The software provided contains a delightful menu program which manages the system very well. The range and scope of the software is well documented in Solidisk's advertisements. Owners of the 128k board may configure their system as either eight banks of RAM or as a 100k silicon disc – very useful for the likes of high speed data sorting or spelling checking.

I admire Solidisk for the flair and imagination of its products, but I'm not a fan of the way it goes about it. I am sure most users would prefer to spend another £8-£10 for a reliable, plug-in-and-go product comprising high quality components.

HCR Electronics

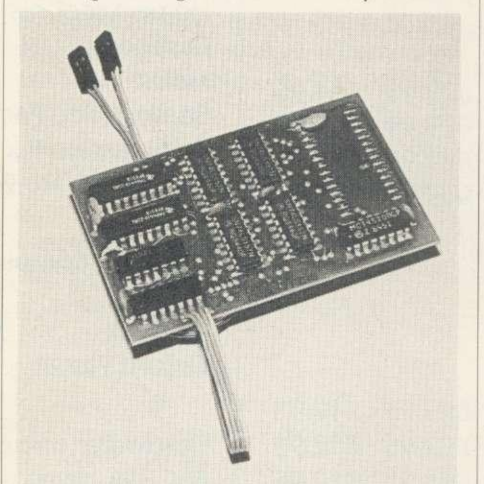
The HCR Electronics RAM board is available in either 16k or 32k versions. The 100mm × 60mm board comprises two (or four) 8452 INMOS dynamic RAMs. If a 16k board is purchased initially it can be upgraded to the 32k version simply by adding the additional RAM chips.

The HCR board is simple to fit thanks to the design and the use of high quality components. The RAM card plugs into socket IC52; a 40-pin header plug with two soldered flying leads sits in the 6502 CPU socket; the processor piggy-backs on top; and a flying lead connects to link S-21. With the 32k unit, a further lead with a spring clip connects pin 11 of IC76.

A three position, write enable/disable switch provided may be fitted into the Beeb's 'ashtray' or at the rear of the computer. It allows either RAM bank to be selected and write-protected and is useful if you want to develop your own sideways software. In use the HCR card performed faultlessly, and just as well when mounted on the HCR external ROM expansion board. This configuration looks untidy but does provide a total of 64k of sideways RAM (providing the board already contains 32k of CMOS RAM). However, I can't say whether this configuration is reliable when the ROM board is full.

Ram Board	Solidisk 32/64/128	HCR 16/32	Ramamp RAM 16	Acorn User UserRAM
Design	3	4	4	4
Construction	3	5	4	4
Ease of installation	1	4	4	5
Versatility	4	3	4	4
Software provided	3	–	4	4
Documentation	4	3	3	4
Value for money	3	4	4	3
Total (out of 35)	21	23	27	28
Key: 5 *Excellent*, 4 *Good*, 3 *Satisfactory*, 2 *Poor*, 1 *Very Bad*				

How the boards scored on seven points and overall



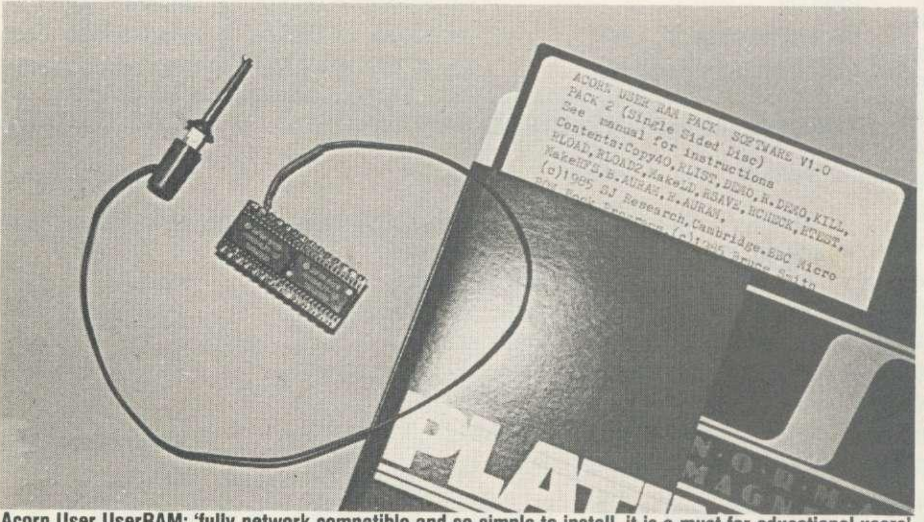
Ramamp 16k board may be ideal for network stations

The HCR RAM board is built to a high specification and the company has informed me that it is developing software which will use this excellent board to the full. For a basic, no-nonsense system at a sensible price, look no further than the HCR RAM board.

Ramamp

If you require a simple 16k of sideways RAM for network stations, then the Ramamp 16k Ram Expansion Board may be just the ticket. This neat, compact unit functions happily in any sideways ROM socket in the BBC micro, and it is capable of loading any utility into its 16k of dynamic RAM, that is addressed from &8000 to &BFFF. Naturally, it works equally well in stand-alone computers.

The 90mm × 55mm board comes with a disc of utility programs and four A4 sheets of instructions and software details. Fitting the board is straightforward. Apart from plugging in the board itself, there are two flying leads to connect – one goes to link S-21, the other to



Acorn User UserRAM: 'fully network compatible and so simple to install, it is a must for educational users'

two pins on the Tube connector. Second processor users will need to contact Ramamp regarding arrangements for this lead.

As no bits of the I/O port are used the Basic ROM can be fitted in a higher priority than the RAM board, which also means that all eight bits of the I/O port are yours. I was rather concerned with the large pins on the board, but closer inspection revealed that they have been machine tapered to a sensible cross-section. A link connector is provided on the board to enable a write-protect switch to be included.

The accompanying software comprises some useful utilities. A menu program makes the loading of ROM-image software fail-safe. There are two printer buffers – one transforms the RAM page into a 15k printer buffer, the other is very clever: it allows an 8k 'ROM' to be loaded, then places a 7k printer buffer in the otherwise wasted RAM above it. Two DFS patches are provided (to conform with Acorn's 0.9 and 1.2 versions). Each uses the sideways RAM as DFS workspace.

The system functions very well, particularly on a network where a Ramamp board is fitted to every machine except the fileserver, so that any utility can be loaded into all machines simultaneously for use by every student. Indeed any sideways software could be called from the fileserver by any station (see *Acorn User* October '85 pages 135-137).

UserRAM

On opening the box my first thought was: 'Where is it?' as this RAM card's so tiny. It comprises a board no larger than an EPROM, on which are mounted two 8k RAM chips and a flying lead with a spring clip. UserRAM certainly wins the prize for the quickest and easiest installation – a three minute job.

The UserRAM fits into any of the ROM sockets of the Beeb or B+ and may be doubled up with a second UserRAM in an adjoining socket or up to three with the B+. In practice, it is best inserted into IC88 in the model B.

The RAM board comes with a disc of ten utilities. Pack one contains a demonstration ROM image and software to manage the ROMs, ROM image software and the RAM in the computer. Pack two contains these and the *Acorn User* RAM utilities (see Richard Harris' articles in the June, July and August '85 issues), a suite of programs from the *BBC Micro ROM Book* by Bruce Smith, and the book is thrown in too. In all, an extremely useful compendium of supporting software. The only item missing is a comprehensive menu program like Solidisk's which would help manage ROM image software.

UserRAM works very well with the Viglen cartridge system and Micro Pulse Rombox, two expansion systems which should be popular with UserRAM owners. I did not test UserRAM with any ROM expansion boards, as the best option would be to use CMOS (6264) RAM chips in this case. As UserRAM is fully network compatible and so simple to install, it is a must for educational users.

The depth and breadth of the supporting software make it very attractive to those wishing to develop firmware, albeit at a high price. However, the versatility of the software and the guarantee of further support from the magazine makes this particular board an attractive proposition.

In my opinion, *Acorn User* is to be congratulated for helping to gain wider acceptance of the concept of sideways RAM. It 'expands' the sideways ROM concept to the full, and it's now up to the software publishers to provide licences for their ROM image software.

Whether you decide on a purpose-built sideways RAM board or opt for the new Aries and Ramamp 32k shadow/sideways RAM boards is a purely personal choice, governed by available finances as much as anything. The versatility offered by supporting software is an important consideration and must be taken into account if you want to get the most from your new acquisition.

JARGON

Printer buffer – Memory used to hold data being sent to the printer, thereby 'freeing the micro' for other use.
EPROM – Erasable Programmable Read Only Memory. Used to hold commercial software.
Workspace – An area of memory used by a sideways ROM to perform its calculations and store data.
Silicon disc – Memory used as a filing system. Its advantage is its speed.
Shadow RAM – Memory used to display the screen, freeing the normal screen memory for programs. (See First Byte on page 53.)

ADDRESSES

Solidisk Technology
17 Sweyne Avenue, Southend-on-Sea, Essex SS2 6JQ. Tel: (0702) 354674.
HCR Electronic Services
HCR House, Bakers Lane, Ingalestone, Essex CM4 0BZ. Tel: (0277) 355407/8
Ramamp Computers
25 Avon Drive, Whetstone, Leicester. Tel: (0533) 864966
UserRAM
Acorn User, 68 Long Acre, London WC2E 9JH. Tel: 01-836 2441.

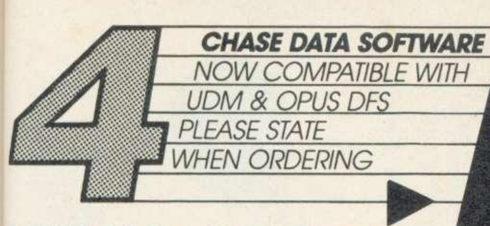
Board	Manufacturer	RAM option	RAM position(s)	RAM write protect	Installation	Cost	Software provided
SWR 32	Solidisk Technology	32k	15,14	No	Bared wires to	£58	5 discs
SWR 64		64k	15,14,13,12	No	push in (or	£85	5 discs
SWR 128		128k	15,14,13,12,11 10,9,8	No	solder) to legs of chips	£135	5 discs
HCR 16	HCR Electronics	16k	15 to 12	Yes	Plug in	£36.22	No
HCR 32		32k	15 to 12	Yes	Plug in	£47.72	No
RAM 16	Ramamp Computers	16k	15 to 12	Optional	Plug in	£32	8 utilities
UserRAM	Acorn User	16k	12,13	No	Plug in	Pack 1 –£45.50 Pack 2 – £62	10 utilities 27 utilities +book

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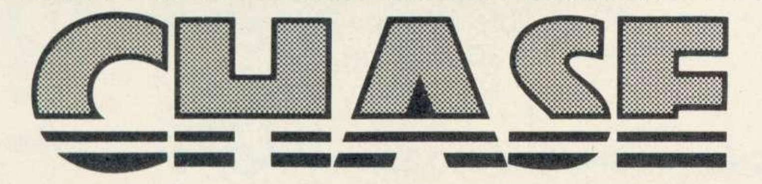
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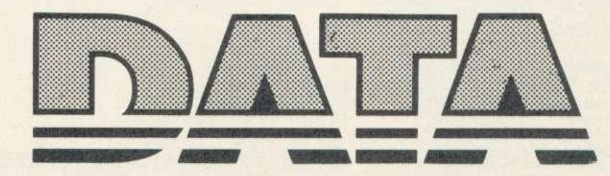
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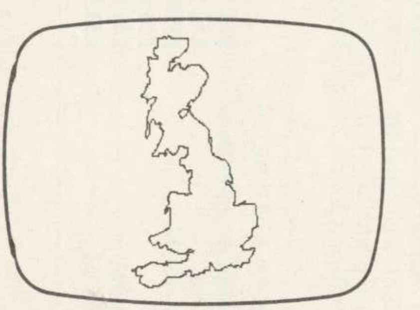


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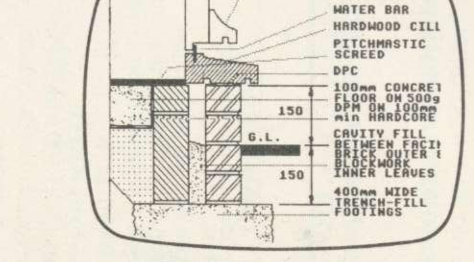


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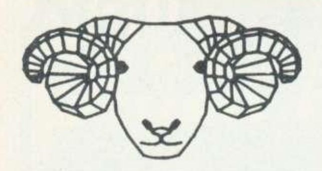
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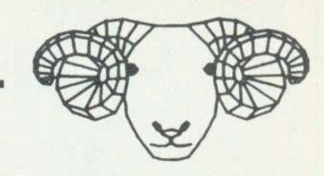
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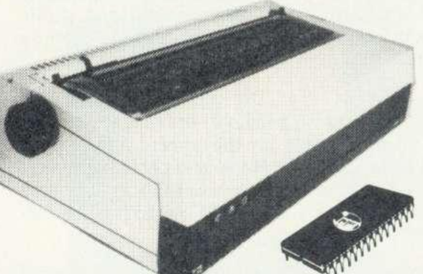
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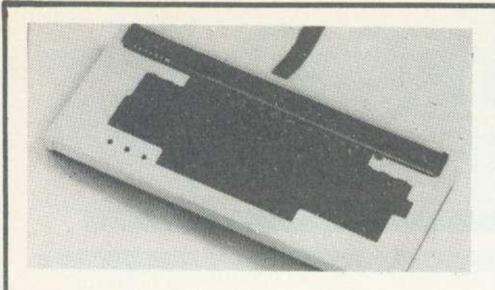
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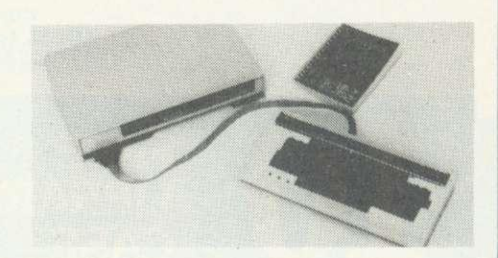
The CPU housing is made from plated steel with an external acrylic bonded vinyl coating. So it's light, tough but good looking and just as important easily cleaned. It houses your BBC computer board (all issues of B and B+) and power supply, as well as single or twin 'half-height' disc drives if required. It maintains the use of standard BBC Computer connectors, and can if required be fitted with a 3" fan for additional cooling.

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Carriage £4.00 for keyboards, £4.00 for CPU case or £6.00 for keyboard & CPU case. Units are priced individually so that users could run a detached keyboard from an existing BBC computer, please state when ordering. We will install your components into our case for £20.00 (including carriage packing and insurance back to you), PLEASE PHONE US FOR A RETURNS NUMBER BEFORE DESPATCHING ANY ITEMS OF EQUIPMENT TO US FOR FITTING.



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DisCat is easy to use and makes printing labels for your discs the simplest of tasks. Create labels for your whole collection of discs or just for one.

Additional information shows you the size of the disc (40 or 80 track, single or double density) and the amount of space used. Each disc is tagged with a volume number for easy identification. There is room for a comment on the label plus the data catalogued and the number of files present on the disc.

As each disc is catalogued you are given the opportunity not only to add comments to the disc label but to also make comments beside each file held on the disc. DisCat's built in database provides full database facilities allowing the resulting information to be searched for any filename or reference.

Discat uses standard sized labels and comes with 50 labels to get you going. Plus a comprehensive manual.

```
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No. of files 12        :Cataloged 20/06/85
-------------------------------------------
$.!BOOT   $.CatInit $.CatLbl  $.Days%   $.DisCat
$.DiscMan $.Dummy1  $.id      $.Menu    $.System
$.ViewCat A.ViewCat
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Comment: Disc Catalogue Utility
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LIST MANAGER is available from MICROTEST on disc with full manual at **£14.95** inc postage and packing. Please state 40 or 80 track when ordering.

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If you have a BBC Micro and keep a dairy herd we are sure that you would like to run **DairyFile.**

DairyFile will let you save time and money by simplifying the record keeping and calculations relating to the dairy herd. Yield, feed, finance, breeding and illness details can be converted into graphs and print-outs for each cow, each monthly group, or the whole herd.

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DairyFile £69.00 inc VAT plus £1.00 p&p
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Disc Menu ROM

Designed to save time and alleviate problems for the overworked user who needs to run programs from disc in a hurry. No need to worry about 31 files on a disc and trying to find the file required, hidden amongst other data files with similar names.

By simply pressing a number key in the range 0-3 and the BREAK KEY, the computer will 'auto menu' the drive number selected. Something that used to take a couple of minutes can now be done in as little as five seconds.

Also included in the ROM are many useful utilities, including:

CONCEAL REPAIR KILL ROMS CLOSE EX LEX FORM FREE MAP VERIFY LCAT REVIVE DEAD HIDE EXCLUDE REVEAL MENU.

Also included is REPAIR, an intelligent verify utility. So even if your disc does crash 'Menu ROM' can now try to repair it losing only a minimum of data.

A total of 17 EXTRA commands, at the very affordable price of **£12.95** INC VAT. **P&P £1.00.**

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It's here, the New Issue 2+ Starstick ROM & Quickshot Joystick

Picture shows Starstick ROM, Patchlead and Quickshot Joystick (along with Acornsoft's Elite Package – by kind permission of Acornsoft)

This new release of the very popular Starstick & Quickshot programmable joystick offers new possibilities. Over 30 extra commands which include: *Elite, *Replica, *Sneaky, *Plonk, *Adval, *Prop, *Kill, *Revive, *Reset, *Repeat, *Map, *Ksave, *Kload, *Cursor and *Stick.

Fully help driven format with 20 page manual including full fitting instructions.

Not only is the package fully programmable, but it's response time is also user variable. Thus giving YOU the ability to tailor the joystick to YOUR requirements, as only YOU can.

The new issue software is fully compatible with Disc versions of Acornsoft's 'Elite', Acornsoft's 'Aviator' and Clares 'Replica'. It features relocatable workspace to enable it to work with many of the few games it would not work with before. As in the previous issue, the Starstick ROM is fully 'TUBE' compatible.

Specifically designed with the Disc user in mind, the software is not affected by any combination of the BREAK, SHIFT, or CONTROL keys.

The self centring, rapid action Joystick plugs into the user port and is managed by the Starstick ROM. The ROM monitors O.S. calls and patches the joystick into games programs. The Starstick functions with most games and even those that are not designed to function with joysticks. IT IS VERY IMPORTANT HOWEVER THAT THE GAMES USE LEGAL OPERATING SYSTEM CALLS AS MOST DO.

The New prices are:

Starstick ROM (version 2+) and Quickshot II	**£29.50**
Starstick ROM (version 2+) and Patch lead	**£25.30**
Starstick ROM (version 2+)	**£19.55**
Starstick ROM Reprogramming Charge	**£5.50**

The Patch lead option allows you to plug any ATARI/SPECTRUM Style joystick into the BBC computer with the STARSTICK ROM.

PLEASE INCLUDE £1.00 for CARRIAGE and packing.

Also included in the package is a powerful ROM Manager to enable you to 'KILL' (temporarily) any ROMs that might cause you problems.

All commands in MICROTEST ROMs can be prefixed by 'M' should any other ROM try to intercept the same command name.

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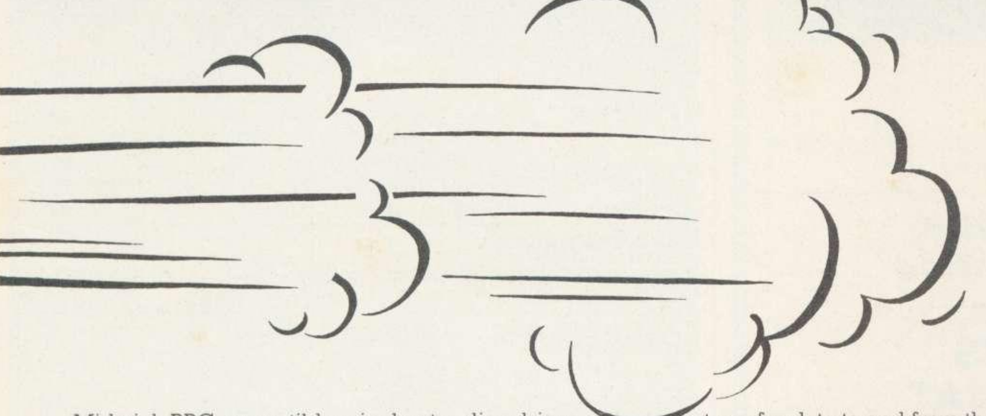
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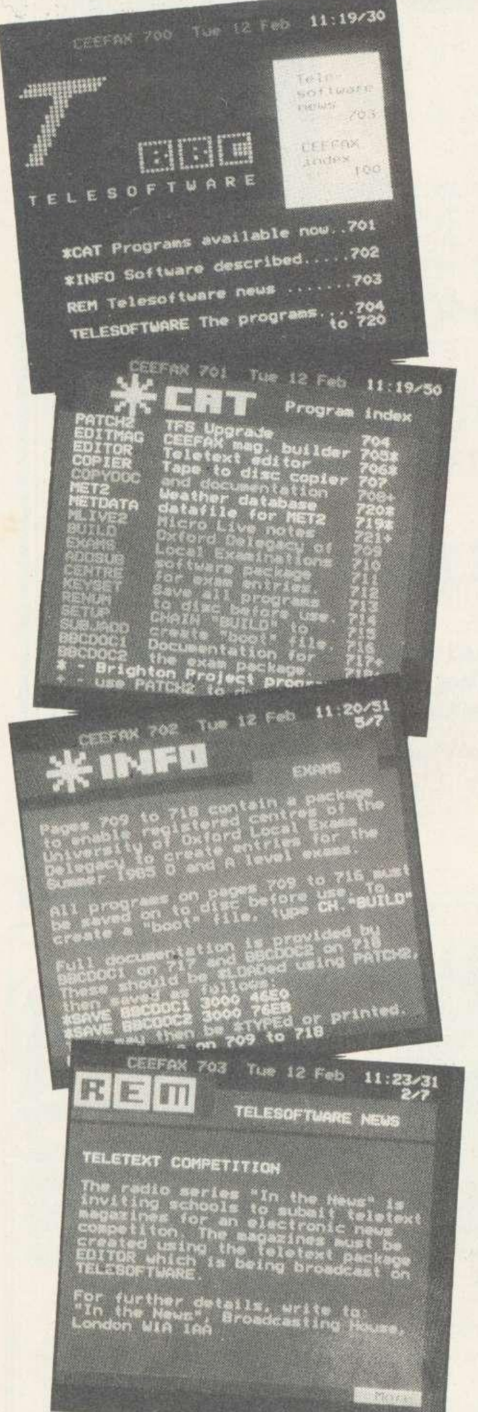
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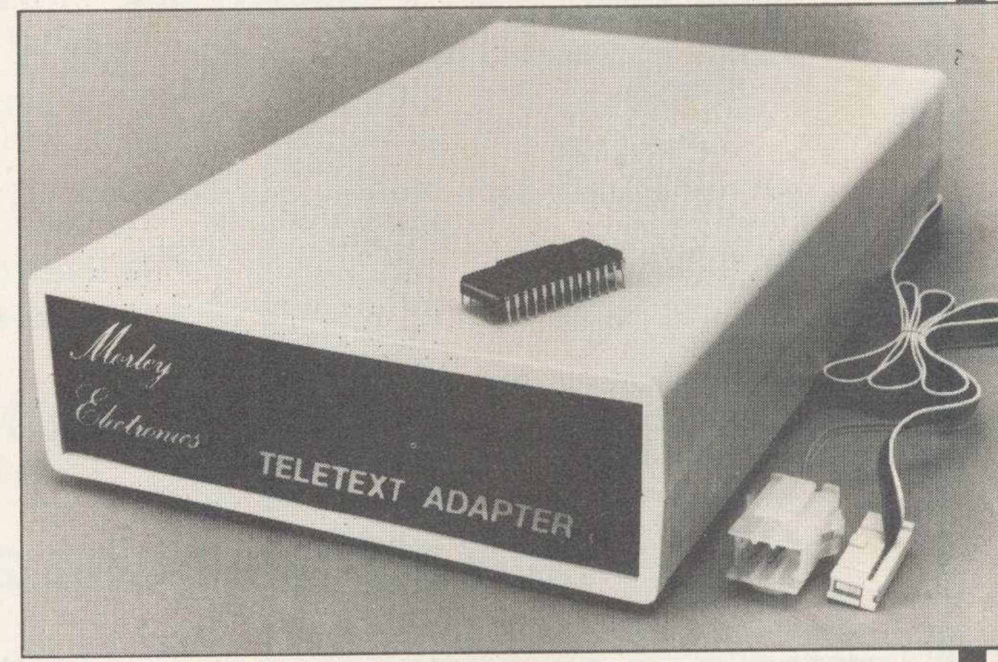
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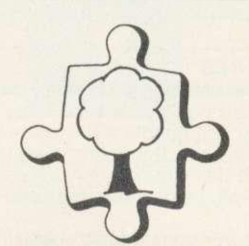
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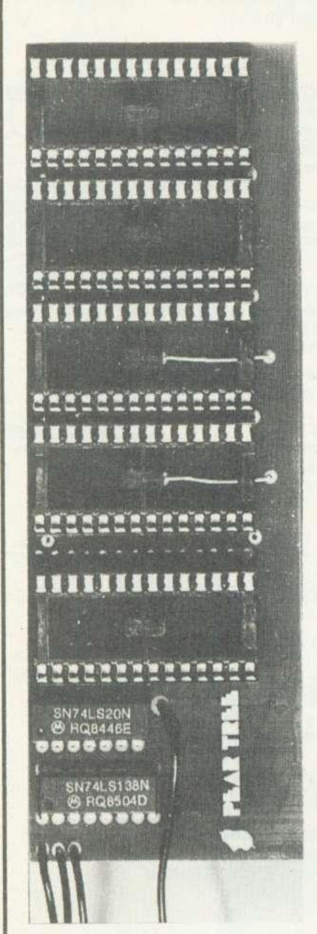
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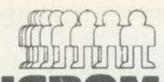
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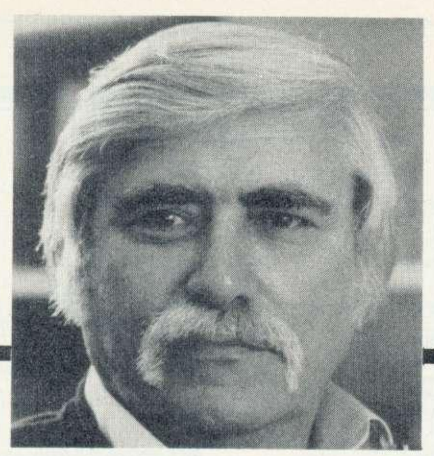
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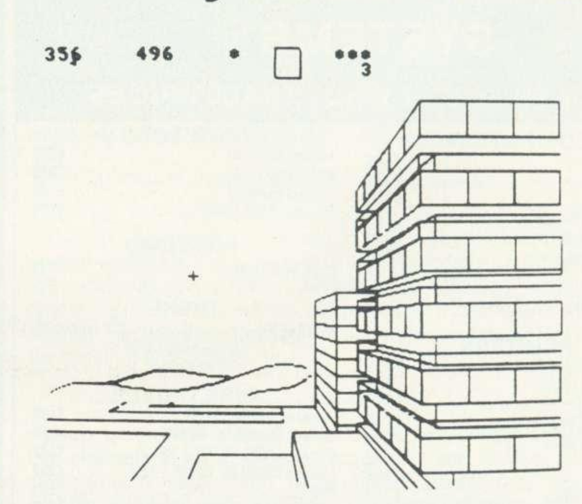
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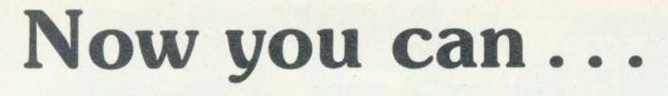
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EPROMs for sale, three weeks old. 27128-25 16k and 2764-25 8k. Tel: Colin on (0747) 840 828 after 8pm or weekends.

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ACORN USER ADVERTISEMENT PAGES – DECEMBER ISSUE

64 Software Centre	212
A B Designs	234
Abacus Business Machines	221
Acornsoft	6/143
Addictive Games	27
Akhter Computer Group	12,13,14
Amcom	146
AMS	28/29
Aries Computers	222
BCC	232
Beebugsoft	IFC/1/86/161/223
Bel Tech	92
Brian Train Club	226
Broaway Electronics	188
C & C Co.	238
C-Tech	230
Cambridge Micro Centre	77
Cambridge Computer Store	220
Care Electronics	206
Carey	228
Carson Developments	229
Chalice Software	122
Chase Data	214/215
Cheetah Marketing	84
CJE Micros	190
Clares Micro Supplies	160/186
Clef Products	221
Clwyd Technics	148
CMS	146/180
Comco Engineers	222
Compshop	200
Computer Concepts	144/145
Computer Village	232
Computatill	208
Contex Computing	98
Crofton Electronics	220
Crossware Products	222
Cumana	32/33/88/182
Database Publications	96/97/235
Dataharvest	200
Datapen	168
Datastar Systems	134
Datastore	234
Davis Rubin Associates	170
Design Dynamics	194
Discotechnology	52
Edition Scheme	20
Educational Software Company	174
Electro-Music Research	33
Electronequip	158
Ferguson	4-5
G.C.C. (Cambridge)	128/129
GEC (Telecomm)	172
Gemini Marketing	22-25
Golem	234
Grafsales	217
Griffen Computers	54/225
HCR Electronics	208
IDS Computer Supplies	227
Interface Electronics	76
Kenda Electronic Systems	130
LCL	148
Linear Graphics	50
Logik Engineers	226
M M Microwave	84
Macob Systems	233
Marbry Planning	33
Mayday Software	236
Meadow Computing	229
Medstat	148
Memoco Electron	194
Mertec	192
Micro-Media	75
Microman Computers	233
Micronet	152-154
Micropacs	33
Micropower	79
Microtest	224
Microworld	218/219
Midwich Computer Co.	227
Minerva	98
Mirrorsoft	6/19
Morley Electronics	231
Mud	IBC
No. 1 Systems	222
Oak	132
Ocean Software	10/21
Opus	156/157/202
Pace	26/155
Paean Systems	221
Paul Fray	221
Peaksoft	208
Peartree Computers	138/226/233
Pineapple Software	184
Printerland	236
Quest	232
Rickitt Educational Media	229
Robico Software	210
Robocom	198
RSD Connections	226
Seiko	BC
Shards Software	174
Shumwari Associates	194
Silent Computers	238
Silicon City	227
Slogger Software	184
SNT	229
Softlife	194
Solidisk	34-40
SP Electronics	238
Speedysoft	78
Squirrels Byte	228
Store Stock Systems	98
Structured Software	236
Superior Software	8/196
Synergy Software	193
Syntax Software	236
Systems	178/216
Tandata Marketing	58/59
Technomatic	41-47
Tekform Products	236
Tiger Software	170
Torch	90/126
Twillstar	30-31
US Gold	80-81
Vannin Software	227
Viglen Computer Suppliers	162-167
Vine Micros	225
Voltmace	176
Walkbury Consultants	204
Watford Electronics	62-72
We-serve	228
Wizard Development	159

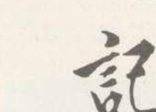
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ACORN USER'S

DIARY

Life on the Cam

Life at Acorn has certainly gone through a lot of changes in the past year (for one thing there's a lot less of it). They now have a new Master to look after the 128keenies left (there used to be 512), who isn't much of a Communicator, but at least a lot of Consultants have been in to help them sort things out. So this month we'll let you take a look at life behind the scenes.

Parking narks

Acornsoft is shortly expected to add 'Creative Parking' to its best-selling range which includes *Creative Graphics* and *Creative Sound.* Designed and developed by Acorn R&D (known as RND because you never know what they'll come up with next), the game has been rigorously tested in the Grayhound bus car park.

The game was the brainchild of Andrew McCarpark (more of he later) who inadvertantly parked diagonally on the pavement one day. Current hi-score is held by Bruce 'Gudday' Cockprocessor who managed to park across three spaces leaving all the doors and the boot open, plus the engine running.

Business division MD John No-claims-bonus was disqualified by safety officers.

Meantime speed freak Andrew McLegless recently took too many riscs at a drag party. Attempting to prove himself even more armless than Mike 'Podd' Howitzer he tripped over his own dress and broke his leg.

When we tried to get through on the phone for an official comment the message from the swithboard was 'Sorry – we think Andy Hopper's left the company'.

So what did happen to Porsche-driver Andy Doppler? It seems he's shifted himself over to the science park working for a company called 'Qudos'. Sounding like a well-known operating system our suspicions of a defection were confirmed when it was revealed that Qudos stands for 'Quick designs on Sinclair's'.

Apparently two other directors are Peter O'Creep and Hermann Houseboat. We thought their names sounded familiar and, sure enough, it turns out they were on the Acorn board until someone discovered that neither were 100 per cent Italian.

Silly-Billys

Acorn appears to have taken on some ex-Sillydisk engineers judging by the look of the 64k upgrade to the B+ which is designed to be fitted by dealers only. Not content with there being 10 leads to fit, nine are soldered (on the under side of the main circuit board) and there are two tracks to cut. As all the leads are different colours, we suggest you give your dealer an eye test first.

Young gifted and single

A feature of Acorn's RND division is that many of the designers are very young – a high proportion are aged between 25 and 30. This fact, combined with Acorn's 'low staff turnover' (meaning no-one's arriving these days), is causing Acorn's personnel manager, Debbie McGoverness one or two headaches – between the years 2025 and 2030 a large section of the department will retire.

Being a forward looking company, Acorn has to plan for this eventuality. The proposed solution is to make Acorn into a family company and replace the ageing boffins with their sons and daughters who can take over the ropes for another generation.

This scheme has only one problem – most of the wireheads aren't married.

This perhaps explains the following anonymous advertisement placed in a recent issue of the *Cambridge Evening News:*

'Intelligent long-haired girls needed for matching men with a view to long-term co-processing and upgradeability.'

But in a recent secret RND poll the woman voted most eligible female employee was Debbie McMatchmaker herself.



Editor TQ's chat-up technique: He shifts, she breaks, he tries control, she escapes, he returns, she runs, he goes to, but in the end they have trouble with his control codes.

We're sure you can come up with a better caption than this one elicited by a competition among the staff of Redwood Publishing – if you can, send it in to Acorn Abuser's Diary.

Budget brain surgery

Next month we'll be publishing the first in a three-part series on how to convert an Electron into a budget second processor. In the first instalment Alex van Sideways-ROM will concentrate on making use of the extra memory available alongside the ordinary RAM, the screen RAM, the sideways RAM and the other bit of sideways RAM in your B++.

In the second part Kitty looks-better-in-real-life Milne will concentrate on the advantages to be gained from the slower RAM, to be followed up in the third article by Bruce I-want-a-12-meg-Beeb Smith describing the hardware modifications needed to your brain to make you want to use it.

Slipped disc

Is it that certain software isn't selling, or are the lads at Acorn running out of discs? One of them recently had cause to send a disc to *Acorn User*, and underneath the label was the old label for the Acornsoft Accounts Payable package!

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07:15 SQUASH
V6:SARAH

20:10 RECORD
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